TB 750-240

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

MAINTENANCE AND REPAIR PROCEDURES FOR S-141/G, S-144/G, S-250/G, S-280/G, AND S-318/G TYPE SHELTERS

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HEADQUARTERS, DEPARTMENT OF THE ARMY
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TECHNICAL BULLETIN
No. 750–240

HEADQUARTERS
DEPARTMENT OF THE ARMY
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SECTION I

INTRODUCTION

1. Scope

This technical bulletin covers the requirements for repair and overhaul of basic Shelters, Electrical Equipment S–141/G, S–144/G, S–250/G, S–280/G, and S–318/G. Repair procedures for any additional maintenance parts of a modified lightweight shelter is provided in the applicable technical manual.

NOTE

A basic shelter is a shelter the configuration of which has not been changed by the installation of electrical or mechanical equipment or its physical structure has not been changed by the addition of openings or vents, rearrangement of existing facilities, mounting of air conditioners, heaters, etc.

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38–750.

NOTE

Include a detailed description of the damage; clearly define the nature, extent and cause of the damage. Include sufficient detail to determine if the damage constitutes a design deficiency or a manufacturing defect which requires redesign or field modification of the shelter in question.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700–58 (Army), NAVSUP Pub 378 (Navy), AFR 71–4 (Air Force), and MCO P4030.29 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55–38 (Army), NAVSUP Pub 459 (Navy), AFM 75–34 (Air Force), and MCO P4610.19 (Marine Corps).

d. Reporting of Equipment Publication Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, U.S. ARMY Electronics Command, ATTN: AMSEL–MA–Q, Fort Monmouth, N.J. 07703

3. Lightweight Shelter Characteristics

a. Type of construction ..... Stressed skin aluminum foam-core with laminated bond between skin and foam-core.

b. Dimensions of the shelters are as follows:

Shelter type No.	Vehicle (ton)	Maximum outside dimensions (inches) Length	Width	Height
S–141/G	2½	142	81	82
S–280/G	2½	147	87	83⅜
S–250/G	1¼	85	79	70
S–144/G	¾	77	57	62½
S–318/G	¾	77	72½	70⅜

4. Identifying Features

The lightweight shelters are fabricated by several commercial manufacturers and are used with equipment in the Area Type Communication Systems and other communication systems. Examples of shelters are shown in appendix B.

SECTION II

MAINTENANCE ALLOCATIONS

5. Operator/Crew and Organizational

a. Repair. No repair or replacement is authorized by the operator or crewman. Organizational maintenance personnel will repair all skin punctures to render the lightweight shelter weathertight, using Repair Kit, Electronic Equipment Shelter MK-680/G (app C). Shelters that have a radiofrequency interference (rfi) suppression requirement will not be repaired at organizational maintenance (see the following note).

NOTE

A puncture in a shelter that has an rfi suppression requirement will be repaired at the direct support maintenance category. Immediate patching is necessary to prevent detection by enemy intercept equipment and radio interference with other communications equipment.

b. Replacement. Replacement is limited to easily removable parts, such as gaskets, door filters, and padlocks. Replacement parts authorized for organizational maintenance are listed in the basic issue items and repair parts and special tools list of the technical manuals for the prime equipment.

6. Direct Support

a. Repair. Direct support will repair unsound fiberglass patches (applied by lower categories of maintenance), all fiberglass patches below the shelter fording line, and skin punctures, as well as emergency repair (para 14). Use Repair Kit, Electronic Equipment Shelter MK-681/G (app D) to repair fiberglass patches and skin punctures.

b. Replacement. Replacement is authorized for all parts listed in (1) through (12) below in all instances where the part is secured in place with threaded fastening devices. Refer to the appropriate publication (*c* below) for specific part authorization details.

(1) Skids (installed with removable fasteners).
(2) Towing eyes.
(3) Lifting eyes.
(4) Steps, folding.
(5) Door, lower.
(6) Door, upper.
(7) Latches.
(8) Handles.
(9) Hinges.
(10) Louver assembly.
(11) Sling, lifting and tiedown assemblies.
(12) Latchbolts.
(13) Shield, radiofrequency (rf).
(14) Filter, rf (installed with removable fasteners).

c. Replacement Part Publications. Refer to the following publications for shelter and shelter part replacement details:

(1) S-141/G, TM 11-5410-206-12P, TM 11-5410-206-35P.
(2) S-144/G, TM 11-5410-205-12P, TM 11-5410-205-35P.
(3) S-280/G, TM 11-5410-213-15P.
(4) S-318/G TM 11-5410-212-15P.
(5) Federal Supply Catalog Identification List C-5410-IL-A, Covering FSC Class 5410, Prefabricated and Portable Buildings, 1 Jan 66.

7. General Support

General support is authorized to perform all repairs covered in section VI. The quality of repair, whenever possible, should be in accordance with the depot overhaul standards (sec VII).

8. Depot

Depot maintenance includes all procedures necessary resulting in a repaired shelter that meets the requirements of the depot overhaul standards (sec VII); however, the provisions of AR 750-27 must be observed with respect to maintenance expenditure limitations (para 13). When depot per-

sonnel lack sufficient technical information (such as maintenance techniques and application of repair materials to repair a particular type shelter), request the technical information from Commander, U.S. Army Electronics Command ATTN: AMSEL–MA–Q, Fort Monmouth, N.J., 07703. When requesting information for a particular type shelter, list the shelter nomenclature (include the basic shelter nomenclature as well as the nomenclature assigned when part of a prime equipment), serial number, order number, model number, and manufacturer's name.

WARNING

A repaired shelter that does not meet the depot overhaul standards (sec VII) could cause loss of life or limb, or serious damage to the equipment contained within, during lifting or moving operations.

SECTION III

MAINTENANCE PRECAUTIONS

9. Applying Skin Patches

Repair skin damage in accordance with the instructions in appendix C and the note in paragraph 5. Smooth damaged shelter skin as much as possible. Force the bonding mixture between any delaminated skin and foam-core areas involved to retain the rigidity and strength of the shelter. Do not allow a metal-to-metal contact between the outer skin and the inner skin of the shelter.

10. Welding or Soldering Maintenance Parts

Welding or soldering operations on the shelter panels or on maintenance parts installed on the shelter are depot repair procedures and must be performed with extreme caution.

WARNING

Foam-core materials used in the lightweight shelters are highly flammable under a welding torch flame and release harmful black smoke when ignited. Elevated temperatures will destroy the original cellular form of the foam-core and leave the aluminum panels unsupported. *Do not* allow the temperature of the skin surface to exceed 54.6° C. Use Thermometer, Self-Indicating, Bi-Metallic MX–1570/G (FSN 6685–663–4811) to monitor surface temperature. *Do not* perform any welding or soldering operations near the foam-core.

11. Lubrication

Lubricate door hinges, vent hinges, ventilating fans, and door latches of the shelter during routine maintenance checks. Use one of the following lubricants:

a. Lubricating Oil, Internal Combustion Engine, Sub Zero, MIL–L–10295B (1 qt, FSN 9150–273–2389).

b. Lubricating Oil, Internal Combustion Engine, Sub Zero, MIL–LX10295B (1 qt, FSN 9150–242–7602).

12. Painting

a. S–250/G, S–280/G, and S–318/G Shelters (fig. 27, 28, and 29). These shelters are painted with solar heat reflecting paint which is easily identified by its forest green color. Shelters *not* painted with solar heat reflecting paint are olive drab in color. USE ONLY THE FOLLOWING PAINTS FOR TOUCHUP OR COMPLETE REPAINTING OF THE S–250/G, S–280/G, and S–318/G:

(1) *Undercoat.* Use white, lusterless enamel, produced in accordance with Federal Specification TT–E–516, Enamel, Lusterless, Quick-Drying Styrenated Alkyd Type. It is available in a 1-pint pressurized can (FSN 8010–878–5761) and in a 1-gallon container (FSN 8010–297–2111).

(2) *Topcoat.* Use the following green, lusterless enamel, produced in accordance with Military Specification MIL–E–46061 (MO) Enamel, Camouflage, Solar and Heat Reflecting. It is available in a 1-quart container (FSN 8010–905–7133) and in a 1-gallon container (FSN 8010–985–7258).

(3) *Shelter floor.* Use the following gray lusterless enamel, produced in accordance with Federal Specification TT–E–527 Enamel, Lusterless Alkyd Type.

NOTE

The existing paint need not be removed before applying the solar heat reflecting paint; simply clean the surface well before applying the white undercoat. When the undercoat is dry, apply the green topcoat. If the shelter has been repaired, or the original paint is in poor condition, prepare the surface in accordance with the instructions in MIL–F–14072 and use the white lusterless enamel as the undercoat.

b. S–141/G and S–144/G Shelters. These shelters were originally painted with paint that was *not* solar heat reflecting. When touchup painting is required, use enamel, lusterless, olive drab

(34087) available in a 1 gallon container (NSN 8010-00-297-0560), or lacquer, lusterless, olive drab (34087) available in a 1 gallon container (NSN 8010-00-292-3053). If complete refinishing is required, prepare surfaces per MIL-F-I4072 and use either of the above finishes.

SECTION IV

EXTENT OF REPAIR

13. General

Any seriously damaged shelter should be returned to the depot. Serious damage is defined as bent, dented, unsupported, or ruptured structural members in shelter panels, particularly in edge or corner areas. Maintain all other shelters as follows:

a. When skin punctures occur, patch the punctures as soon as possible (app C) to prevent moisture seepage into the laminated panels of the shelter, and (if appropriate) to reestablish rfi suppression. See Note, paragraph 5*a*.

b. Keep all maintenance parts in good repair, tightened, and in place, to prevent elongation of mounting holes and moisture seepage in the laminated panels of the shelter.

14. Emergency Procedures for Seriously Damaged Shelter

a. General. In a tactical field situation, emergency repairs may be required as follows:

(1) To render a shelter weathertight to protect its contained equipment.

(2) To prepare a shelter for emergency evacuation.

b. Procedures.

(1) Employ any usable materials available to improvise repairs.

NOTE

If an rfi suppression requirement applies to the shelter, refer to the note in paragraph 5*a*.

(2) Use the MK–681/G to repair holes or opening (app D) to make the shelter weathertight.

(3) Stencil or paint the following caution notice in letters at least 4 inches high on both sides of the shelter, approximately at eye level:

CAUTION

Seriously damaged shelter; do not sling lift.

(4) Request through normal supply channels that the seriously damaged shelter be replaced by a class A item.

SECTION V

HANDLING REQUIREMENTS

15. Lifting Procedures

a. When lifting the shelter (with a crane or helicopter), be sure to use the correct sling assembly as indicated below:

Shelter	*Sling assembly*
S–141/G	Sling, multiple leg, SC–D–36423 (FSN 5410–805–5533).
S–144/G	Sling, multiple leg, SC–C–36302 (FSN 5410–785–3245).
S–250/G	Sling, multiple leg, SM–D–649952.
S–280/G	Sling, multiple leg, SC–D–36423 (FSN 5410–805–5533).
S–318/G	Sling, multiple leg, SM–B–564739.

b. Be sure that the sling assembly cables are connected to the *lifting eyes* (with the turnbuckle ends of the cables next to the lifting eyes) of the shelter before lifting. On "Craig Round Corner" shelters, do not attempt to lift shelter with the sling assembly cables connected to the tiedown eyes.

c. Slowly lift the shelter with the crane or helicopter. *Do not* jerk the shelter when lifting. A pull greater than the actual amount required to lift the shelter will tear the lifting eye assemblies from the shelter.

d. Avoid swinging the shelter from side to side. The additional stress placed on the lifting eye assemblies will tear the lifting eye assemblies from the shelter.

e. Do not bounce or jar the shelter. Bouncing or jarring can loosen the bond between the skin and foam-core and reduce the rigidity and strength of the shelter.

f. Do not attempt to *butt* shelters into place with a forklift. The lightweight shelters are not structurally designed for this mode of handling. If the shelter is crated, pallet-mounted, or has forklift instructions stenciled on the exterior, a forklift may be used to move the shelter.

CAUTION

If an uncrated shelter is not pallet-mounted and does not have forklift instructions stenciled on the exterior, DO NOT USE A FORKLIFT TO MOVE THE SHELTER; SLING LIFT THE SHELTER INSTEAD.

16. Loading and Securing Shelters on Trucks

a. Load and secure the S–141/G and S–280/G type shelters on a truck (fig. 1 and 2) as follows:

(1) Use the sling center hooks (nearest the turnbuckles) to connect the sling assembly to the lifting eyes.

(2) Place the sling assembly on top of the assemblage.

(3) Connect the four sling hooks to the lifting ring.

(4) Place the lifting ring over the lifting hook of the lifting device.

WARNING

To avoid injury to personnel and damage to the equipment, only the personnel engaged in the actual loading operation should be permitted near the truck, lifting device, and assemblage. To eliminate confusion, all instructions must come from the loading crew supervisor.

(5) Tie a ½-inch rope (at least 15 ft long) to each rear towing eye.

(6) Lower the truck tailgate and make sure that all tools and equipment have been removed from the truck body.

(7) Slowly lift the assemblage from the ground to a position high enough to clear the body of the truck.

(8) Back the truck into position under the assemblage.

WARNING

All personnel must remain clear of the truck while the assemblage is being lowered into position.

(9) Position a man at each of the ropes (5) above) to guide the assemblage into position, and slowly lower it onto the truck body.

(10) Remove the lifting ring from the lifting

hook and disassemble the lifting ring and sling hooks. Remove the sling center hooks from the lifting eyes and the ½-inch ropes from the rear towing eyes.

(11) Install the tiedown ring assembly (A, fig. 2) above the center support on the cargo bed siderail of the truck.

(12) Use the hook at the farthest end from the turnbuckle, and hook each end of the sling assemblies to a tiedown eye of the assemblage.

(13) Secure the sling hooks to the tie down ring, making certain that the sling hooks point away from the shelter, (B, fig. 2)

(14) Follow the procedures given in (1), (2), and (3) above to secure the other side of the shelter.

(15) Tighten all turnbuckles evenly by hand; then turn each turnbuckle an additional one-half turn with a bar or rod inserted in the turnbuckle slot.

CAUTION

Do not overtighten the turnbuckles. Overtightening turnbuckles will tear the lifting eye assemblies from the shelter.

(16) Insert the appropriate size skid wooden blocks between the shelter *skids* and the sides of the truck bed to prevent sideway movement strain on the sling assembly cables.

(17) Insert appropriately sized wooden blocks between the shelter *skids* and the cab wall of the truck bed to protect the towing eyes of the shelter and the cab wall of the truck bed.

(18) If the skin is punctured during loading or securing operations, patch the punctures as soon as possible (app C) to prevent moisture seepage into the laminated panels of the shelter, and to restore rfi suppression *if* this requirement exists for the shelter.

(19) Raise and secure the truck tailgate.

(20) Load and secure the S-144/G and S 318/G on a truck (fig. 3 and 4) as follows:

(*a*) Use the sling hooks (nearest turnbuckle) to connect the sling assembly to the lifting and tiedown eyes of the assemblage. Connect the sling hooks at the opposite end of the cables to the lifting ring, and replace the lifting ring over the lifting hook of the lifting device.

(*b*) Tie a ½-inch rope (at least 15 feet long) at each rear towing eye.

(*c*) Lower the tailgate of the truck; make sure that all tools and equipment have been removed from the body of the truck. Slowly lift the assemblage high enough to clear the body of the truck.

NOTE

The entrance door of the assemblage must be at the rear of the truck, and the front end of the assemblage must be placed flush against the front of the truck body.

WARNING

All personnel must remain clear of the truck while the assemblage is being lowered on the truck.

(*d*) Position a man at the free end of each of the ½-inch ropes to guide the assemblage. Back the truck slowly into position under the assemblage, and slowly lower the assemblage to the truck.

(*e*) Remove the lifting ring from the lifting hook, and disassemble the lifting ring and the sling hooks. Remove the sling hooks from the lifting and tiedown eyes and the ½-inch ropes from the rear towing eyes. Raise and secure the truck tailgate.

(*f*) Use two sling assemblies at each side of the assembly to secure the assemblage to the truck as shown in figure 4.

CAUTION

Do not overtighten turnbuckles; overtightening will damage the assemblage.

(*g*) Tighten all turnbuckles evenly by hand, and then turn each turnbuckle an additional one-half turn with a bar or rod inserted in the slot of the turnbuckle.

(*h*) Perform the procedures in (16) through (19) above.

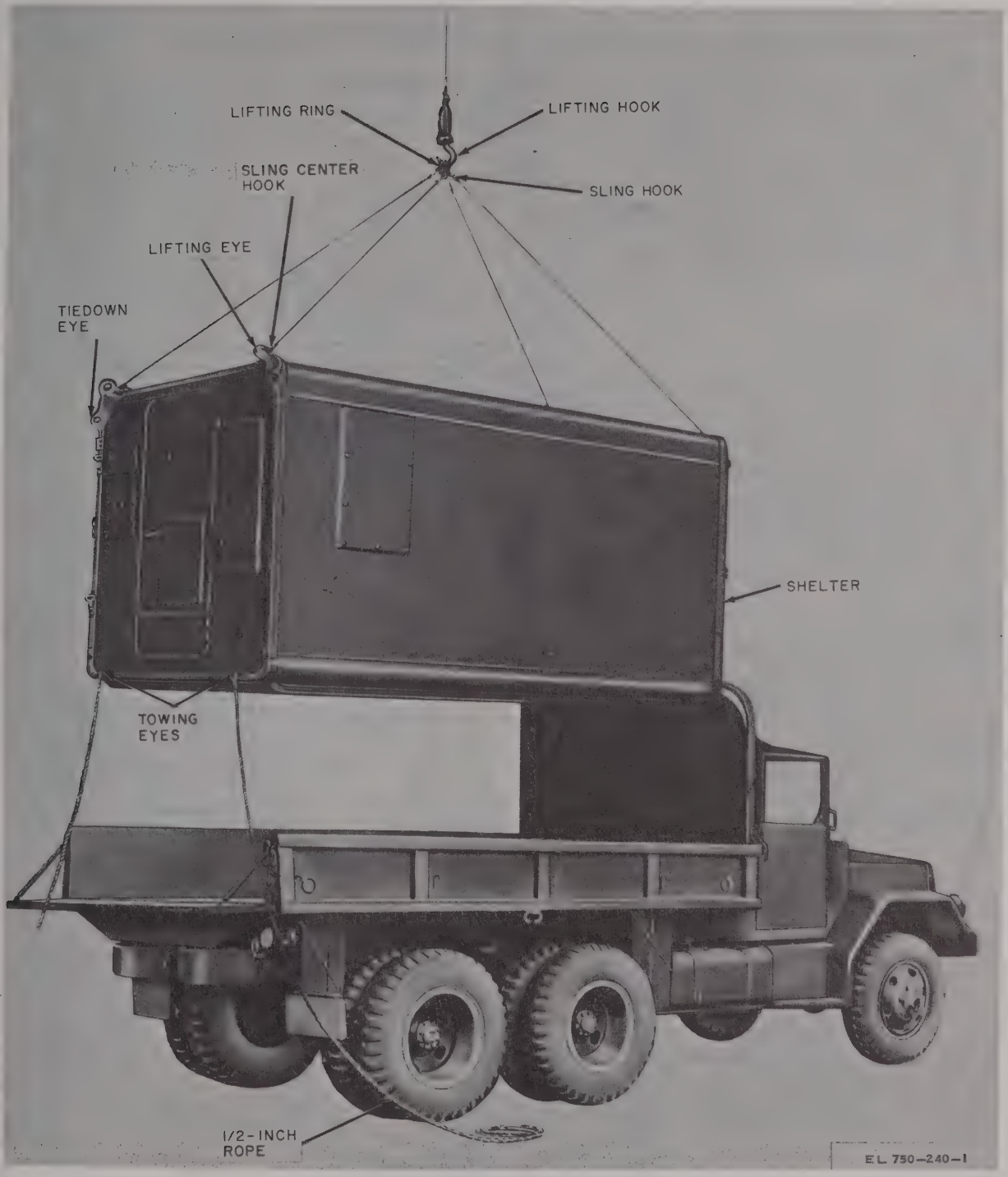

Figure 1. Loading S–141/G and S–280/G type shelters on truck.

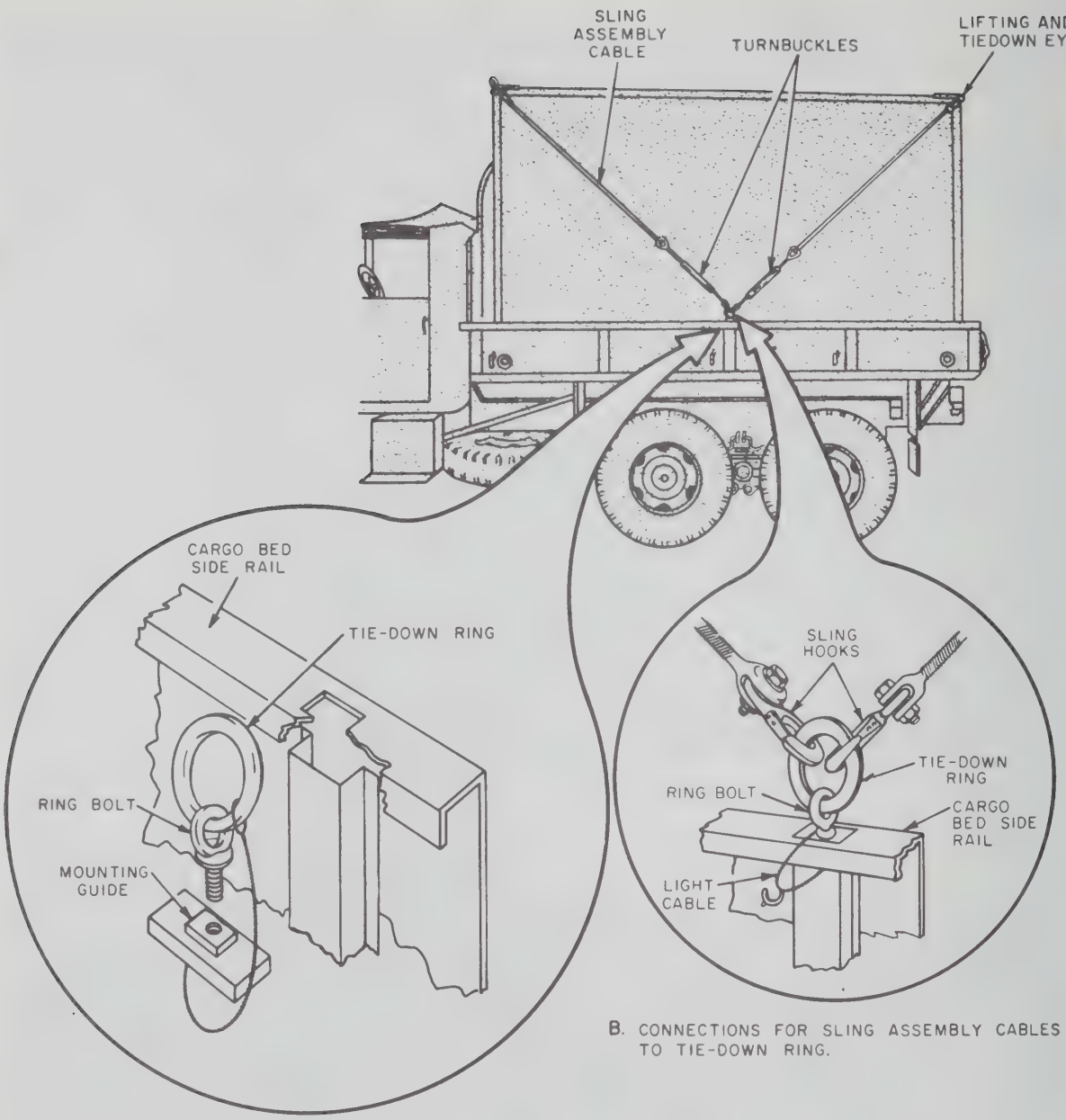

Figure 2. Securing S-141G and S-280G type shelters on truck.

b. Unloading Assemblage. To underload the assemblage from the truck, follow the procedures given in *a* above, reversing the procedures in the order of installation.

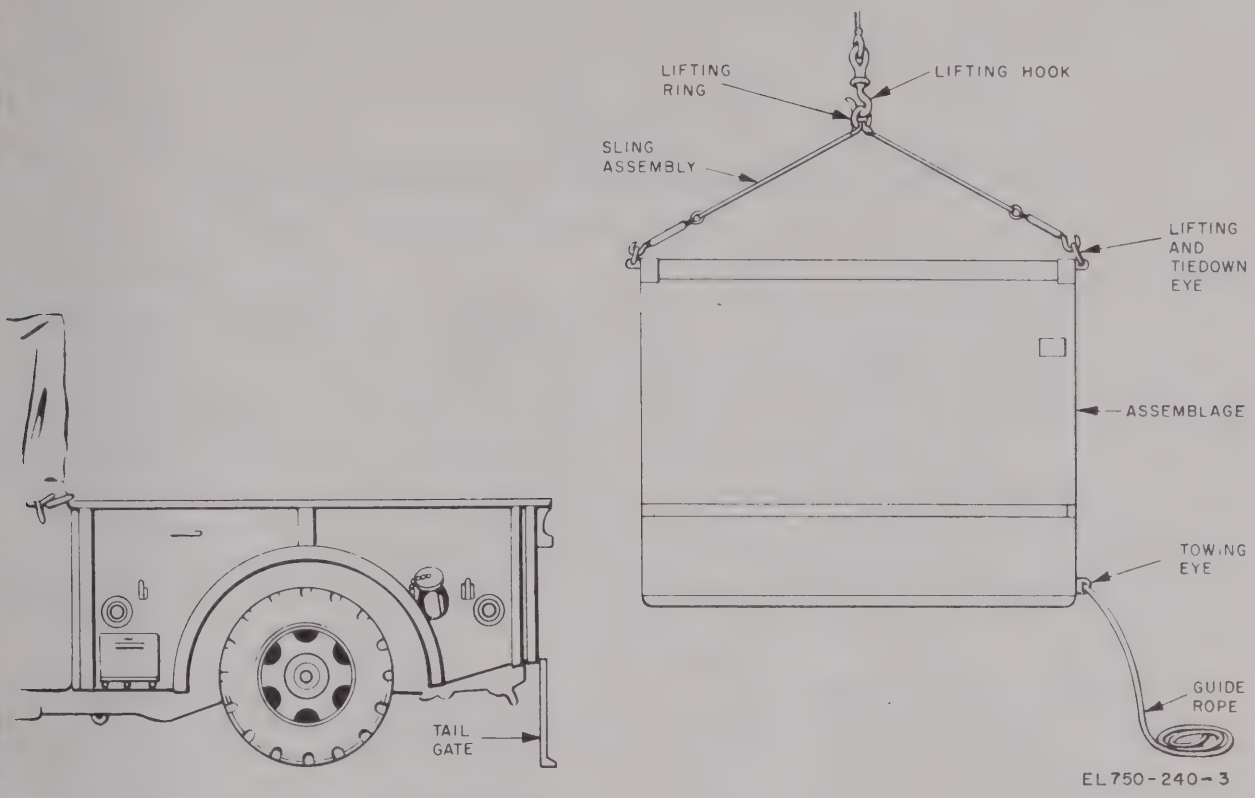

Figure 3. Loading S–144/G and S–318/G type shelters on truck.

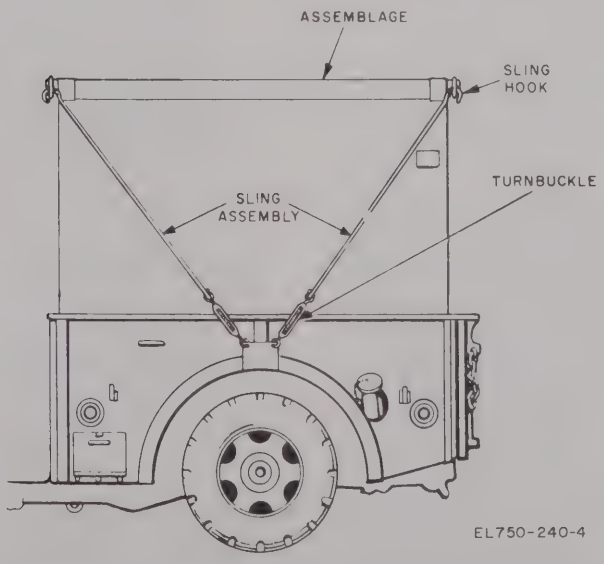

Figure 4. Securing S–144/G and S–318/G type shelters on truck.

SECTION VI

GENERAL SUPPORT AND DEPOT REPAIR INSTRUCTIONS

17. Introduction

General support and depot maintenance activities are authorized to repair all lightweight shelters that do not exceed the maintenance expenditure limitations specified in AR 750–27. The quality of general support repair should, whenever possible, be in accordance with the depot overhaul standards (sec VII). The quality of depot repair must meet the depot overhaul standards (sec VII). The following instructions are approved repair techniques which are provided as a guide for shelter structural repairs.

NOTE

Before performing any puncture repairs, determine if the shelter must meet the requirements for rfi suppression. If the shelter is part of a communication assemblage, or will be used as a replacement shelter for such an assemblage, refer to the technical manuals covering the communication assemblage and the installed equipment to determine if the rfi requirement must be met. After repair of the shelter, test the adequacy of rfi suppression as described in MIL–STD–285.

a. General.

(1) All permanent skin patches will be coated with the bonding agent contained in Maintenance Kit, Electronic Equipment Shelter MK–679/G (app E). The fastening devices for installing external skin patches and maintenance parts will be closed-end type and dipped in the bonding agent prior to installation. When securing aluminum patches with pop rivets, work sequentially from the center of each side of the aluminum skin patch to the corners.

(2) Clean and service air filters, rubber gaskets, and rfi bonding strips when required (replace only when necessary) on all repaired shelters being returned to the user. Replace all air filters, rubber gaskets, and rfi bonding strips when required on repaired shelters being returned to stock. When replacing rubber gaskets, be sure that the gasket channel is thoroughly cleaned. Secure replacement gaskets with the trim cement authorized on the repair parts and special tools list for the end item equipment or contained in the MK–679/G.

(3) The aluminum skin patches contained in the MK–679/G have been treated to prevent corrosion. Aluminum skin of the shelter remaining exposed after filling or patching must be primed with zinc chromate before refinishing.

(4) When aluminum skin patches larger than those contained in the kit are required, fabricate the aluminum skin patches from Aluminum Sheet 6061, Federal Specification QQ–A–250/11, Temper T–6 .040 inch thick. Drill clearance holes for 3/16-inch pop rivets evenly spaced not greater than 1 inch on center and 3/16 ±1/32 inch from the edges.

b. Repair. The chart below indicates and defines the types of repairs and references the paragraphs that provide the repair procedures. In addition to the repairs indicated below, all skin patches applied at lower categories of maintenance must be checked for soundness, and any aluminum skin patches secured with self-tapping screws, below the fording level, must be removed and replaced with riveted skin patches.

Type of repair	*Definition*	*Paragraph*
Rebonding delaminated areas.	A broken bond between skin and foam-core that exceeds a 100-square-inch area.	19
Small or shallow dent	A dent that does not bridge a major structural member and does not exceed a 64-square-inch area.	20
Large or deep dent	A dent that covers a 64- to 100-square-inch area and may or may not bridge a major structural member.	21

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Type of repair	*Definition*	*Paragraph*
Small single skin puncture or cut.	A single skin puncture or cut that does not exceed a 12-square-inch area.	22
Large single skin puncture or cut.	A single skin puncture or cut that exceeds a 12-square-inch area.	23
Damaged panel section	A single skin puncture, dent, or cut on a flat plate area between two structural members that exceeds a 100-square-inch area.	24
Complete puncture	A puncture through exterior skin foam-core, and interior skin, that does not involve a structural member.	25
Multiple small or shallow dents and minor punctures.	An area with extensive number of small or shallow dents and minor punctures.	26
Outside structural member.	An outside structural member that contains an extensive number of small or shallow dents and minor punctures.	27
Exterior skin puncture in shelter with rfi suppression requirement.	Any puncture in the exterior skin of the shelter.	22–26

c. Replacement. All maintenance parts secured with rivets and threaded fastening devices may be replaced. Replacement of damaged shelter skids, interior hardware, mounting brackets, fixtures, etc, secured with rivets, will be replaced utilizing appropriate rivnut fasteners contained in the MK–679/G. Damaged shelter skid replacement is covered in paragraph 28, and the floor tread replacement is covered in paragraph 29. Rivnut and fastening device replacement procedures are covered in paragraph 34.

18. Tools and Materials Required

a. Maintenance Kit, Electronic Equipment Shelter MK–679/G (app E).

b. Tool Kit, Electronic Equipment Shelter TK–144/G (FSN 5180–973–4369) (app F).

19. Rebonding Delaminated Areas

A delaminated panel area results when the shelter skin is broken loose from the foam core, from either a mechanical or a thermal shock loading condition. A delaminated panel area is characterized by a dull, hollow sound when tapped with the finger, as opposed to the tight, drum-like sound of an intact panel. Delaminated panels are never greatly distorted physically, and must not be confused with buckled or *oil-canned* panels. To determine if a panel is delaminated or buckled, use a straightedge to check vertical, horizontal, and diagonal flatness of the panel and determine the *maximum* deviation from flatness. A deviation less than five-sixteenths of an inch indicates a delaminated panel; a greater deviation indicates a buckled panel. In all cases where the delaminated area is over a structural member, use pop rivets evenly spaced (not more than 4 inches apart on center) to secure the skin to the structural member.

a. Approximate the center of the delaminated area, and draw a guideline (with chalk) across the center of the delaminated area parallel to the structural members.

b. Drill clearance holes for 3/16-inch pop rivets evenly spaced (not greater than 12 inches on center) along the chalk line.

c. Drill pressure release holes (no closer than 2 inches from the edge of the delaminated area) evenly spaced around the periphery of the delaminated area as required.

d. Use the calking gun contained in the MK–679/G to force laminating or bonding mix (para 2*b*(1) or (2), (app E) directly into the clearance holes in the guidelines as follows:

NOTE

To facilitate injection of the laminating mix, it may be necessary to drill two holes, at right angles, approximately one-fourth inch from the tip of the polyethylene nozzle of the calking gun with a No. 54 drill.

(1) Force the laminating or bonding mix into the clearance holes, and squeeze the trigger of the calking gun to build-up pressure.

(2) Roll or knead the skin surface from the tip of the calking gun to adjacent holes (clearance or pressure release holes) until the laminating or bonding mix is forced through the adjacent holes.

(3) Release the pressure on the calking gun, remove the calking gun, and cover the clearance hole with masking tape.

(4) Repeat the procedures in (1), (2), and (3) above for each clearance hole in the guideline.

e. Remove the masking tape, and install pop

rivets (dipped in the laminating or bonding mix) in the clearance and pressure release holes.

f. Clean off excess laminating bonding mix with methyl ethyl keytone.

g. Apply a fixed, even surface pressure (approximately 20 pounds per square inch (psi)) to the repaired area for a minimum of 4 hours (24 hours if possible) to insure that the skin of the shelter is held in contact with the foam-core and the laminating or bonding mix is completely cured.

h. Prime and paint the heads of the pop rivets (para 12).

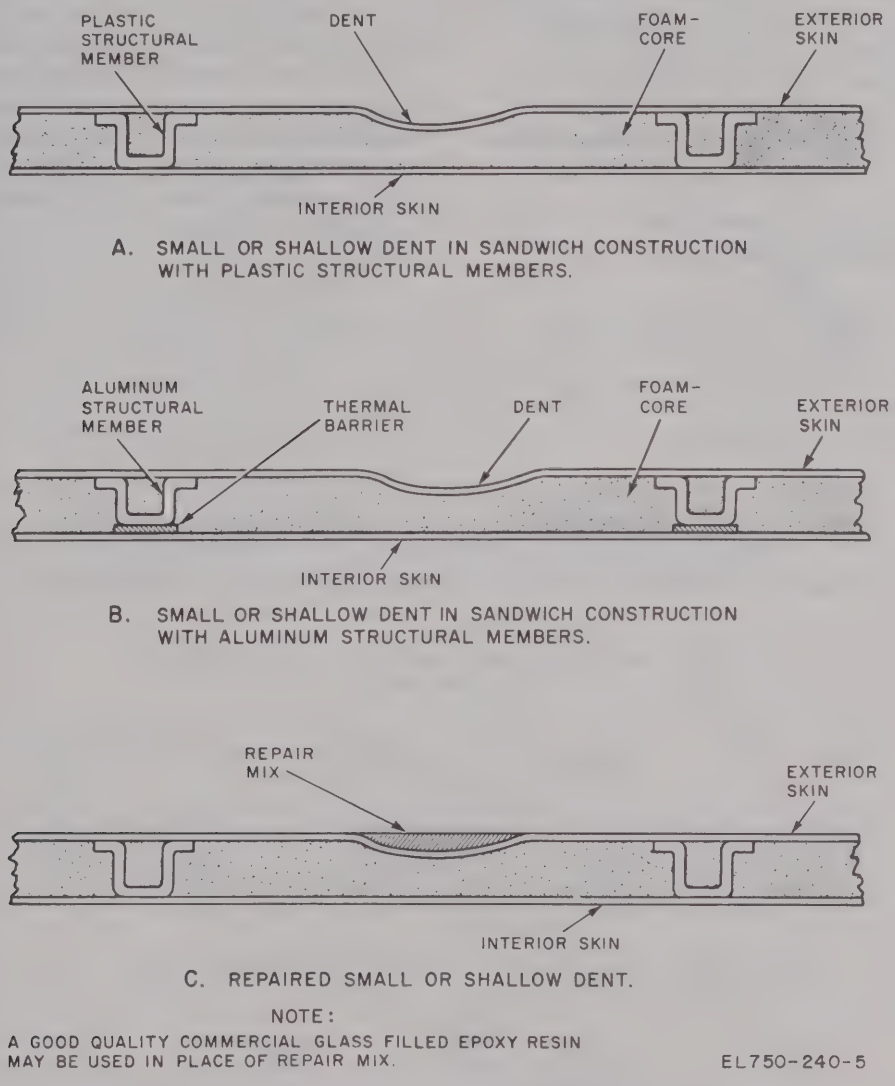


Figure 5. Cross-sectional views of shelter wall showing repair of small or shallow dent (not exceeding a 64-square-inch area).

20. Repair of Small or Shallow Dent (Not Exceeding 64-Square-Inch Area)

NOTE

If the dent is in the shelter door panel, use the procedure described in paragraph 21 to prevent *pop out* of the repair.

a. Remove all paint or foreign matter from the dent (A and B, fig. 5) and an area approximately 3 inches wide around the dent with emery cloth and the cleaner contained in the MK–679/G.

b. Roughen the skin surface with coarse grit emery cloth. Be sure that the area is completely clean. Do not touch the area with hands or wipe with an oily cloth.

c. Fill the dent and smooth out evenly to a featheredge as shown in C, figure 5, with one of the following materials:

(1) Repair mix (para 2*c*, app E).

(2) Any good quality commercial glass filler epoxy resin.

d. Allow the repair mix or resin to set thoroughly in accordance with the manufacturer's recommendations.

e. Sand off excess material flush with the contour of the skin surface.

f. Prime and paint the repaired surface (para 12).

21. Repair of Large or Deep Dent (64- to 100-Square-Inch Area)

NOTE

Extensive damage, such as denting or buckling of the exterior shelter skin which displaces the interior shelter skin, generally constitutes an unrepairable-type damage. Follow the procedure in *a*, *b*, or *c* below to repair a large or deep dent involving only the exterior shelter skin.

a. Located Between Structural Members (fig. 6).

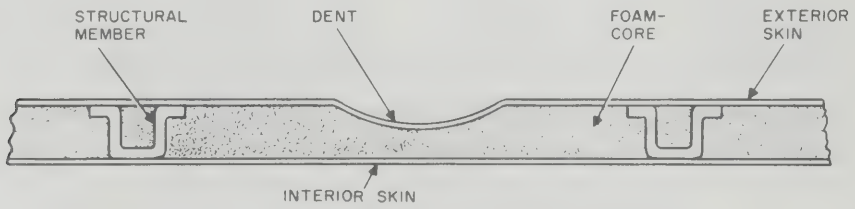
(1) Perform the procedures in paragraph 20*a*, *b*, and *c* by use of A and B, figure 6.

(2) Cut a piece of fiberglass cloth that will cover the restored area and extend approximately 2 inches wide around the filled-in dent.

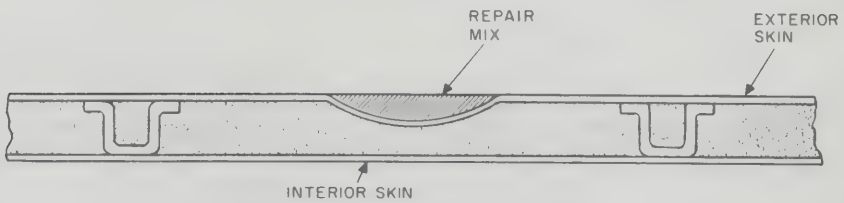
(3) Apply a liberal coating of the bonding agent contained in the MK–679/ over the filled-in dent and approximately 2 inches around the filled-in dent.

(4) Place the fiberglass cloth (C, fig. 6) over the coating of bonding agent, and press lightly.

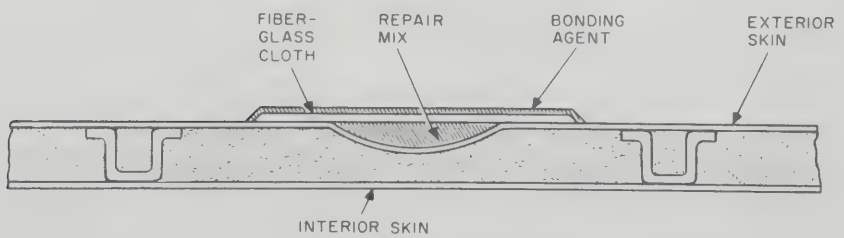
(5) Apply a liberal coating of the bonding



A. LARGE OR DEEP DENT IN SANDWICH CONSTRUCTION BETWEEN STRUCTURAL MEMBERS.



B. LARGE OR DEEP DENT FILLED IN WITH REPAIR MIX.



C. REPAIRED LARGE OR DEEP DENT

EL 750-240-6

Figure 6. Cross-sectional views of shelter wall showing repair of large or deep dent (64- to 100-square-inch area) located between structural members.

agent over the fiberglass cloth; work from the center of the fiberglass cloth to the extreme edges. Be careful that all edges of the fiberglass cloth are thoroughly covered.

(6) Allow the bonding agent to set thoroughly, and sand off excess.

(7) Prime and paint the required surface (para 12).

b. Bridging Structural Member With No Structural Member Damage (fig. 7).

(1) Remove all paint or foreign matter from the dent (A, fig. 7) and an area approximately 3 inches wide around the dent with emery cloth and the cleaner contained in the MK–679/G.

(2) Roughen the skin surface with coarse grit emery cloth. Be sure the area is completely clean. Do not touch the area with the hands or wipe with an oily cloth.

(3) Fill in the dent with repair mix (para 2*c*, app E), and smooth out evenly to a featheredge as shown in B, figure 7.

(4) Allow the repair mix to set thoroughly, and sand off excess flush with the contour of the skin surface.

(5) Perform the procedures in *a*(2) through (7) above; refer to C, figure 7.

c. Bridging Structural Member With Structural Member Damage (fig. 8).

(1) Select an aluminum skin patch from the MKK–679/G that overlaps the dented area by 1 inch.

(2) Position the aluminum skin patch over

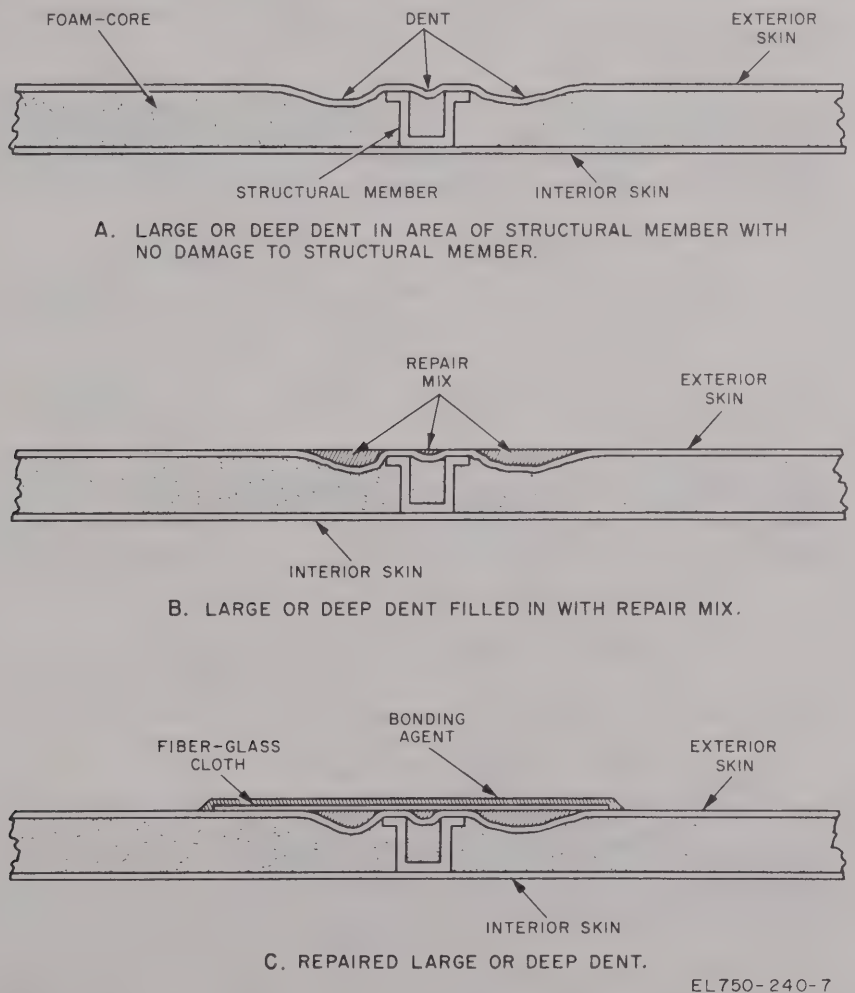


Figure 7. Cross-sectional views of shelter wall showing repair of large or deep dent (64- to 100-square-inch area), bridging a structural member with no structural member damage.

the dent (A, figure 8), and lightly scribe the area of the patch on the shelter skin.

(3) Remove all paint or foreign matter from the dent and an area approximately 1 inch around the scribed mark with emery cloth and the cleaner contained in the MK–679/G.

(4) Roughen the skin surface with coarse grit emery cloth. Be sure the area is completely clean. Do not touch the area with the hands or wipe with an oily cloth.

(5) Fill in the dent with the repair mix (para 2*c*, app E), and smooth out evenly to a featheredge as shown in B, figure 8.

(6) Allow the repair mix to set thoroughly, and sand off excess flush with the contour of the skin.

(7) Use the aluminum skin patch as a template to mark pop rivet holes in the skin of the shelter, and drill No. 30 holes in the skin of the shelter.

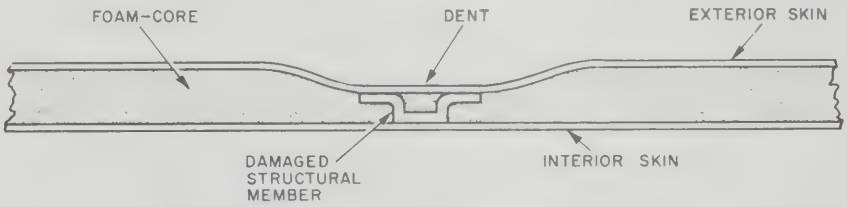
(8) Coat the back surface of the aluminum skin patch with the bonding agent contained in the MK–679/G.

(9) Position the aluminum skin patch over the repaired area.

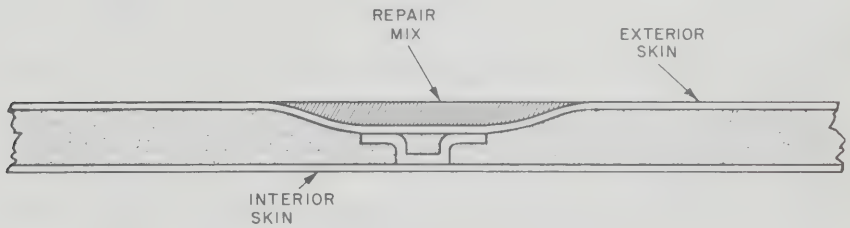
(10) Dip the pop rivets in the bonding agent, and use the riveting tool for pop rivets to secure the aluminum skin patch over the repaired area (C, fig. 8).

(11) Smooth and taper bonding agent squeezed out during the riveting process along the edges of the aluminum skin patch, and remove excess bonding agent.

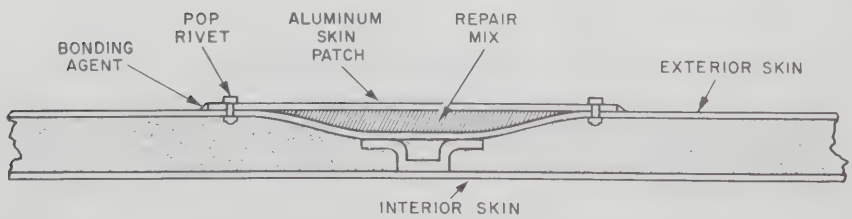
(12) Prime and paint the repaired surface (para 12).



A. LARGE OR DEEP DENT WITH DAMAGED STRUCTURAL MEMBER.



B. LARGE OR DEEP DENT FILLED IN WITH REPAIR MIX.



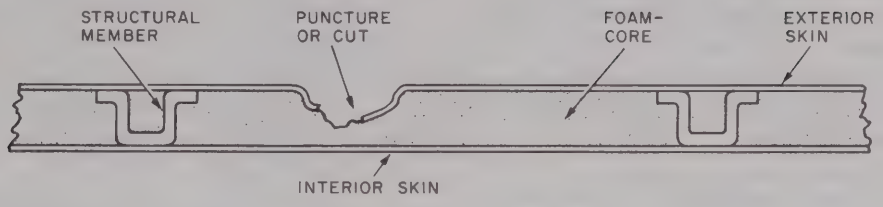
C. REPAIRED LARGE OR DEEP DENT.

EL 750-240-8

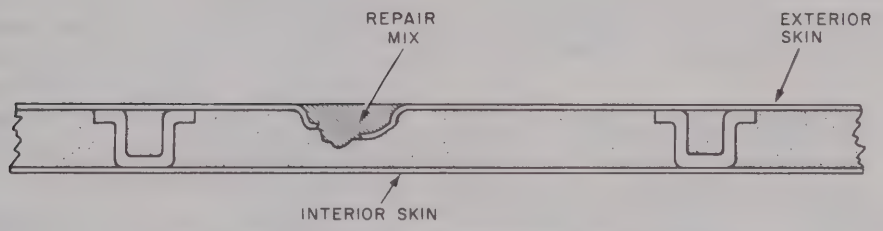
Figure 8. Cross-sectional views of shelter wall showing repair of large or deep dent (64- to 100-square-inch area), bridging a structural member with structural member damage.

22. Repair of Small Single Skin Puncture or Cut (Not Exceeding 12-Square-Inch Area) (A, fig. 9).

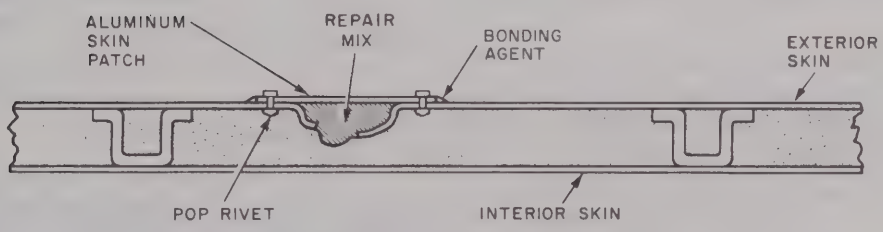
a. Select an aluminum skin patch from the MK–679/G that overlaps the puncture or cut by 1 inch



A. SMALL SINGLE SKIN PUNCTURE OR CUT IN SANDWICH CONSTRUCTION.



B. SMALL SINGLE SKIN PUNCTURE OR CUT FILLED IN WITH REPAIR MIX.



C. REPAIRED SMALL SINGLE SKIN PUNCTURE OR CUT.

NOTE:
A GOOD QUALITY COMMERCIAL GLASS FILLED EPOXY RESIN MAY BE USED IN PLACE OF REPAIR MIX.

EL750-240-9

Figure 9. Cross-sectional views of shelter wall showing repair of small single skin puncture or cut (not exceeding 12-square-inch area).

b. Position the aluminum skin patch over the puncture, and lightly scribe the area of the patch on the shelter skin.

c. Remove all paint or foreign matter from the puncture and an area approximately 1 inch around the scribed mark with emery cloth and the cleaner contained in the MK–679/G.

d. In some instances, *random rivets* are required to insure that the skin of the shelter is pulled up tight to the aluminum skin patch. Drill clearance holes for 3/16-inch pop rivets, in the aluminum skin patch and the skin of the shelter where the random rivets are required. Refer to the chart below to determine the number of random rivets allowed in an aluminum skin patch covering a given area.

Area covered by patch	*Number of random rivets allowed*
Up to 36 square inches	0
From 36 to 84 square inches	4
From 84 to 144 square inches	5
From 144 to 324 square inches	8

e. Roughen the skin surface with coarse grit emery cloth. Be sure that the area is completely clean. Do not touch the area with the hands or wipe with an oily cloth.

f. Fill the puncture with the repair mix (para 2*c*, app E), or any good quality commercial glass filler epoxy resin; then smooth out evenly to a feather-edge as shown in B, figure 9. Be sure to force the repair mix or resin between delaminated skin and foam-core areas.

g. Allow the repair mix or resin to set thoroughly, and sand off excess flush with the contour of the skin surface.

h. Use the aluminum skin patch as a template to mark pop rivet holes in the skin of the shelter, and drill No. 30 holes in the skin of the shelter.

i. Coat the back surface of the aluminum skin patch with the bonding agent contained in the MK–679/G.

j. Position the aluminum skin patch over the repaired area.

k. Dip the pop rivets in the bonding agent, and use the riveting tool for pop rivets to secure the aluminum skin patch to the shelter skin (C, fig. 9).

l. If random rivets are required, use 3/16-inch pop rivets (dipped in the bonding agent) to draw up the skin of the shelter to the aluminum skin patch.

m. Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the aluminum skin patch, and remove excess bonding agent.

n. Prime and paint the repaired surface (para 12).

23. Repair of Large Single Skin Puncture or Cut (Exceeding 12-Square-Inch Area)

a. Between Structural Members. If the puncture or cut did not seriously damage the foam-core, follow the procedures in paragraph 22. If the puncture or cut damaged the foam-core, follow the procedures in (1) or (2) below.

(1) *Using block insulation or cut* (fig. 10).

(*a*) Select an aluminum skin patch from the MK–679/G that overlaps the puncture or cut by 1 inch.

(*b*) Use the aluminum skin patch as a template positioned over the puncture or cut, and lightly scribe the area of the aluminum skin patch on the skin of the shelter.

(*c*) Use the circular saw contained in the TK–144/G to cut and remove the punctured or cut skin area approximately 1 inch within the scribed mark (A and B, fig. 10).

(*d*) Cut the foam-core evenly along the edges where the skin is removed, and remove the damaged foam-core (B, fig. 10). Be careful not to cut the skin on the opposite side.

(*e*) Select a piece of block insulation from the MK–679/G or a cutout of the same-type sandwich construction (C, fig. 10).

(*f*) Size the block insulation or cutout to fit the opening where the skin and foam-core were removed. If a cutout is used, remove the aluminum skin from one side of the cutout.

(*g*) Remove all paint or foreign matter from the overlap area on the skin of the shelter and an area approximately 1 inch around the scribed mark with emery cloth and the cleaner contained in the MK–679/G. If the cutout is used, remove all paint or foreign matter from the aluminum skin of the cutout.

(*h*) Roughen the skin surface with coarse grit emery cloth. If a cutout is used, roughen the surface of the aluminum skin.

(*i*) Coat the interior of the opening where the skin and foam-core were removed with the bonding agent contained in the MK–679/G.

(*j*) Insert the block insulation or cutout into the opening where the skin and foam-core were removed (D, fig. 10).

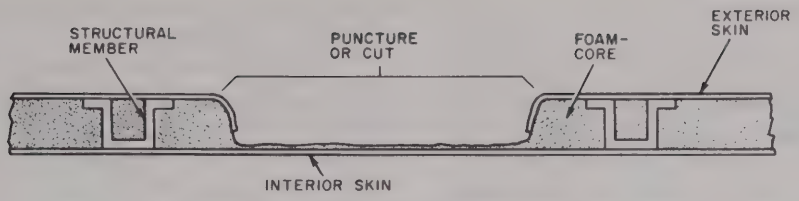
(*k*) Use the aluminum skin patch as a template to mark pop rivet holes in the surface of the shelter, and drill No. 30 holes in the skin of the shelter.

(*l*) Coat the exposed block insulation or cutout and the overlap area with the bonding agent contained in the MK–679/G.

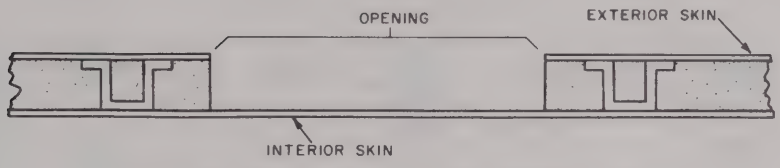
(*m*) Dip the pop rivets in the bonding agent contained in the MK–679/G, and use the riveting tool for pop rivets to install the aluminum skin patch as shown in E, figure 10.

(*n*) Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the aluminum skin patch, and remove excess bonding agent.

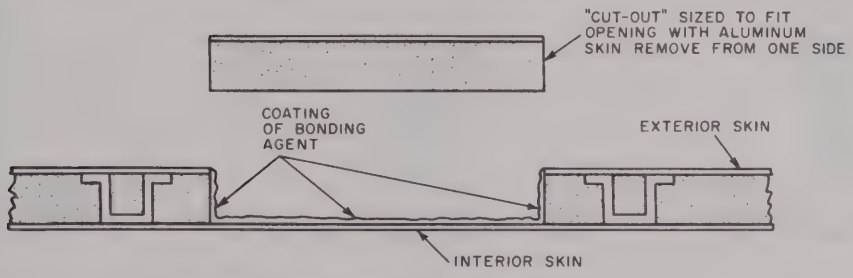
(*o*) Prime and paint the repaired surface (para 12).



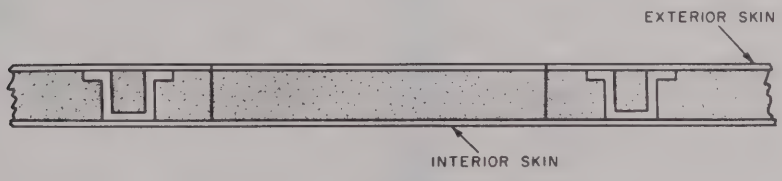
A. LARGE SINGLE SKIN PUNCTURE OR CUT IN SANDWICH CONSTRUCTION.



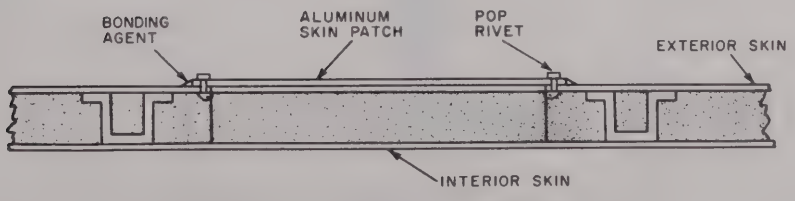
B. EXTERIOR SKIN AND FOAM CORE REMOVED FROM DAMAGED AREA OF SANDWICH CONSTRUCTION.


"CUT-OUT" SIZED TO FIT OPENING WITH ALUMINUM SKIN REMOVE FROM ONE SIDE
COATING OF BONDING AGENT
EXTERIOR SKIN
INTERIOR SKIN

C. OPENING PREPARED FOR INSTALLATION OF "CUT-OUT."



D. "CUT-OUT" INSTALLED IN OPENING.



E. REPAIRED LARGE SINGLE SKIN PUNCTURE OR CUT.

EL750-240-10

Figure 10. Cross-sectional views of shelter wall showing repair of large single skin puncture or cut (exceeding 12-square-inch area) using a cutout.

(2) *Using foaming material* (fig. 11).

(*a*) Perform the procedures in (1) (*a*) through (*c*) above by use of A and B, figure 11.

(*b*) Pressure release holes are required in the aluminum skin patch to release excess foaming material. Use the chart in paragraph 22*d* to determine the number of pressure release holes allowed in an aluminum skin patch covering a given area.

(*c*) Drill pressure release holes (for 3/16-inch pop rivets) symmetrically spaced in the area of the aluminum skin patch that does not overlap the skin of the shelter.

(*d*) Remove all paint or foreign matter from the overlap area on the skin of the shelter and an area approximately 1 inch around the scribed mark with emery cloth and the cleaner contained in the MK–679/G.

(*e*) Use the aluminum skin patch as a template to mark pop rivet holes in the skin of the shelter, and drill No. 30 holes in the skin of

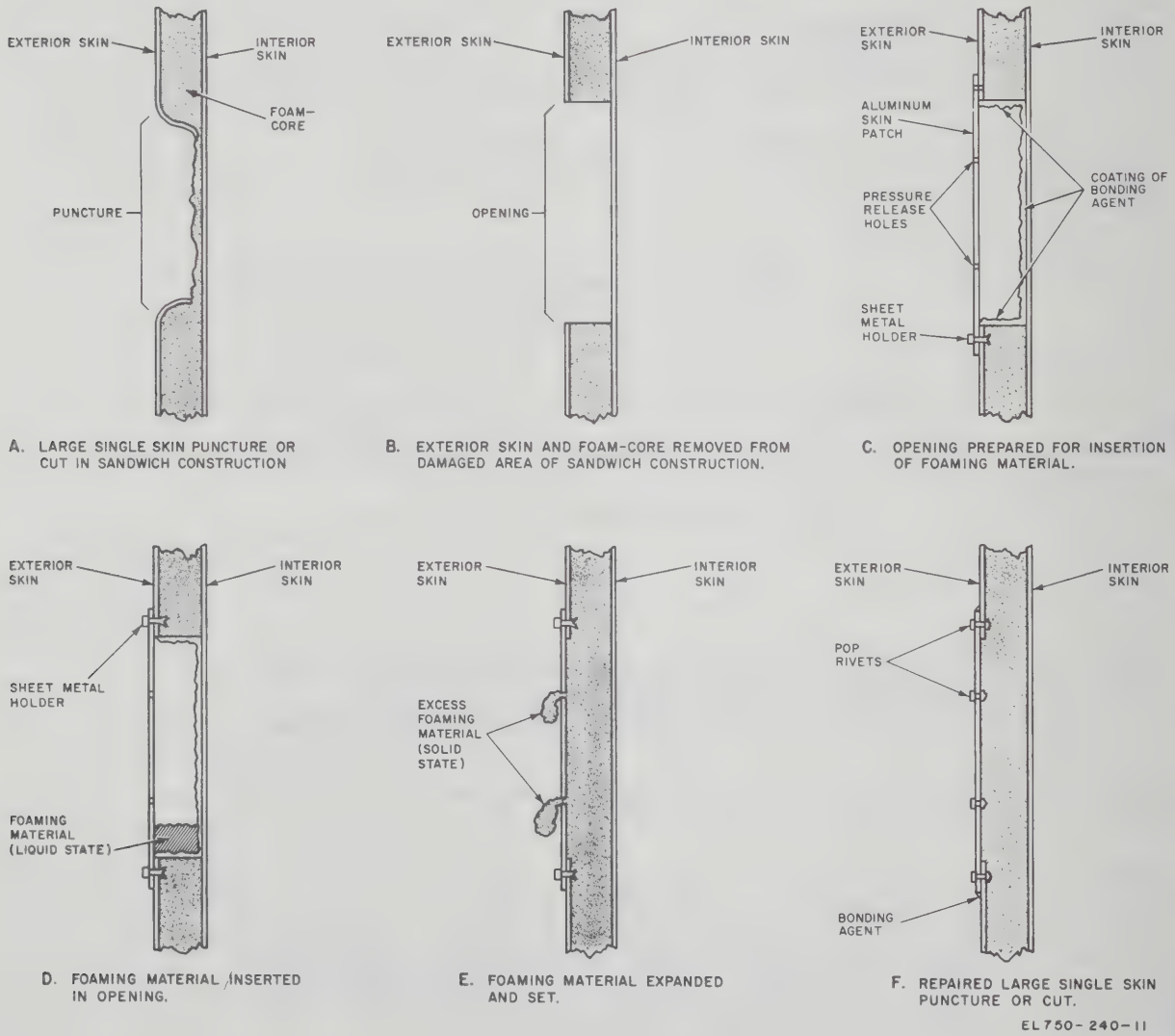
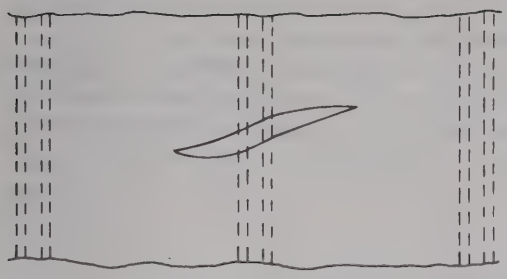
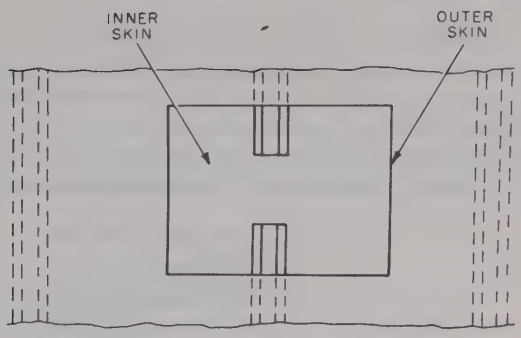


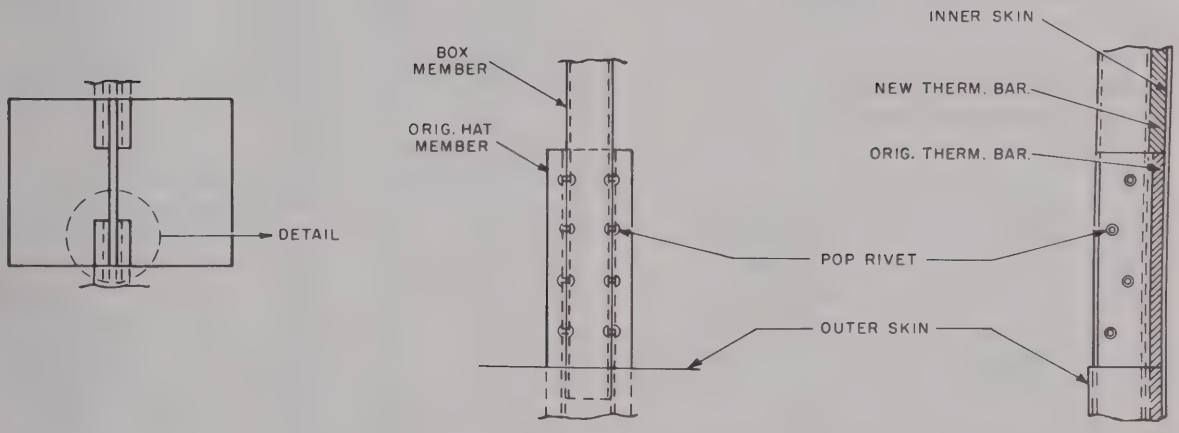
Figure 11. Cross-sectional views of shelter wall showing repair of large single skin puncture or cut (exceeding 12-square-inch area) using foaming material.



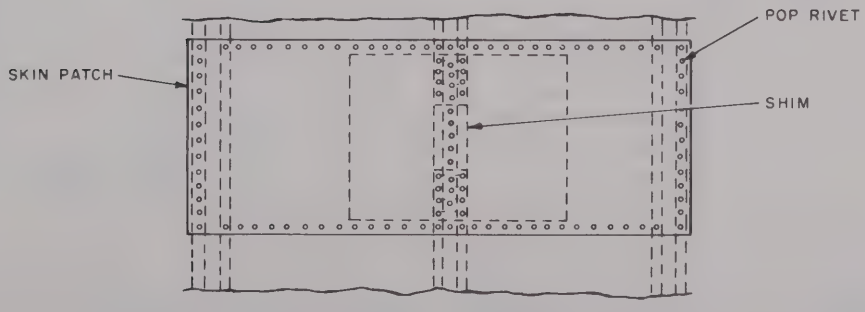
A. SINGLE SKIN PUNCTURE BRIDGING A MEMBER.



B. DAMAGED AREA CUT AWAY AND MEMBER PREPARED.



C. NEW MEMBER SPLICED IN ENDS OF ORIGINAL MEMBER.



D. REPAIRED PANEL SECTION.

EL750-240-12

Figure 12. Repair of single skin puncture which has bridged and damaged member.

the shelter.

(*f*) Coat the interior of the opening (C, fig. 11) with the bonding agent contained in the MK–679/G.

(*g*) Use sheet metal holders in the pop rivet holes to secure the sides and bottom of the aluminum skin patch to the skin of the shelter.

(*h*) Mix the required amount of foaming material (para 2*a*, app E).

(*i*) Pour the foaming material, with even distribution, inside the opening, through the access provided between the top of the aluminum skin

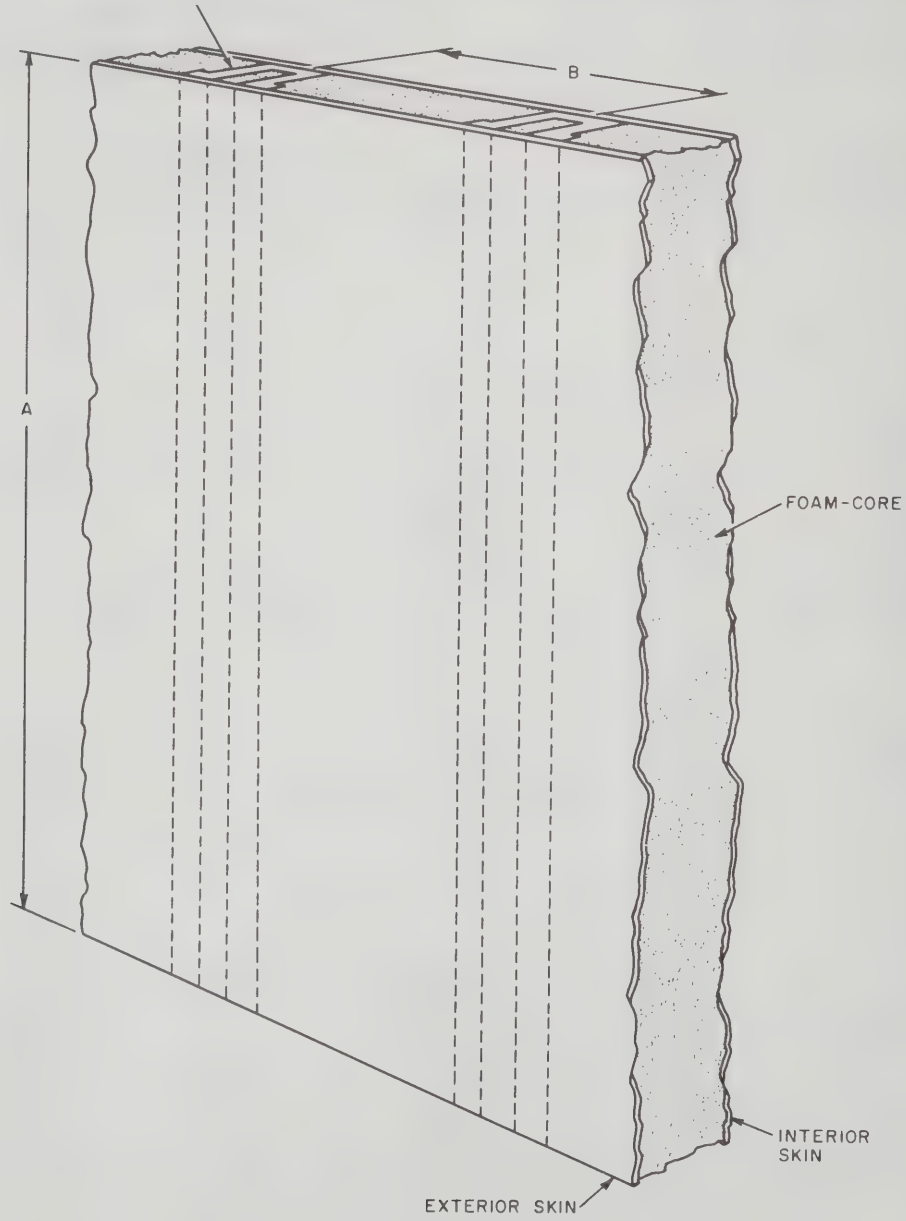


Figure 13. Cutaway view of shelter panel depicting panel section.

patch and the skin of the shelter (D, fig. 11).

(*j*) Immediately use sheet metal holders in the pop rivet holes to secure the top of the aluminum skin patch to the skin of the shelter.

(*k*) Allow approximately 1 hour for the foaming material to expand and set (E, fig. 11); clean off the excess foaming material released through the pressure release holes of the aluminum skin patch.

(*l*) Remove the sheet metal holders, and remove the aluminum skin patch.

(*m*) Coat the exposed foam-core and overlap area with the bonding agent contained in the MK–679/G.

(*n*) Use pop rivets (dipped in the bonding agent contained in the MK–679/G) and the riveting tool for pop rivets to install the aluminum skin patch as shown in F, figure 11.

(*o*) Install 3/16-inch pop rivets (dipped in the bonding agent contained in the MK–679/G) in the pressure release holes of the aluminum skin patch.

(*p*) Smooth and taper the bonding agent (squeezed out during the riveting process) along the edges of the aluminum skin patch, and remove any excess bonding agent.

(*q*) Prime and paint the required surface (para 12).

b. Bridging Structural Member Which Has Structural Member Damage (fig. 12).

(1) Use a circular saw and remove the damaged skin. Avoid cutting the member.

(2) Cut the foam core evenly along the edges where the skin has been cut away, and remove the same. Do not attempt to remove any old adhesive still stuck to the undamaged skin.

(3) Cut the damaged member (and thermal barrier) so that the ends project 4 to 6 inches beyond the edge of the skin cut (B, fig. 12).

(4) Prepare a box extrusion from Aluminum Alloy 6061–T6, Federal Spec. QQ–A–200/8. Fit the extrusion snugly inside the damaged member, and extend it at least under the edges of the cut skin.

(5) Prepare a piece of thermal barrier from Wood, Birch SC–A–47794–52. Fit thermal barrier snugly between the box extrusion and remaining skin, and extend the ends between the ends of the member.

(6) Install the thermal barrier and box extrusion with plenty of the bonding agent from the kit. Rivet the extrusion through the sides of the projected member with 1/8-inch rivets (C, fig. 12).

(7) Install the new foam core (*a* (1) above).

(8) Install an aluminum shim over the member and box section, the same thickness as the removed skin.

(9) Prepare and install a skin patch (*a*(1) above). Install pop rivets in the damaged member and box extrusion to reinforce the repaired section.

24. Repair of Damaged Panel Section

NOTE

The compressive strength of the side or end panel section (fig. 13) in column loading conditions, depends on an intact bond between all elements of the laminated construction. If a major portion of a structural member within the laminated construction is displaced (bowed to the extent where both skins are displaced) from its original plumb position, the damage is not repairable. A single surface damage (not exceeding 50 percent of a total panel section) with no extensive skin to foam-core delamination, may be repaired by following the procedures given in paragraph 23. Extensive single surface damage (exceeding 50 percent of a total panel section) with extensive skin to foam-core delamination may be repaired by following the procedures given below.

a. Use the circular saw contained in the TK–144/G to cut and remove the damaged exterior skin from the panel section (A, fig. 14).

b. Cut the foam-core evenly along the edges where the skin is removed, and remove the damaged foam-core.

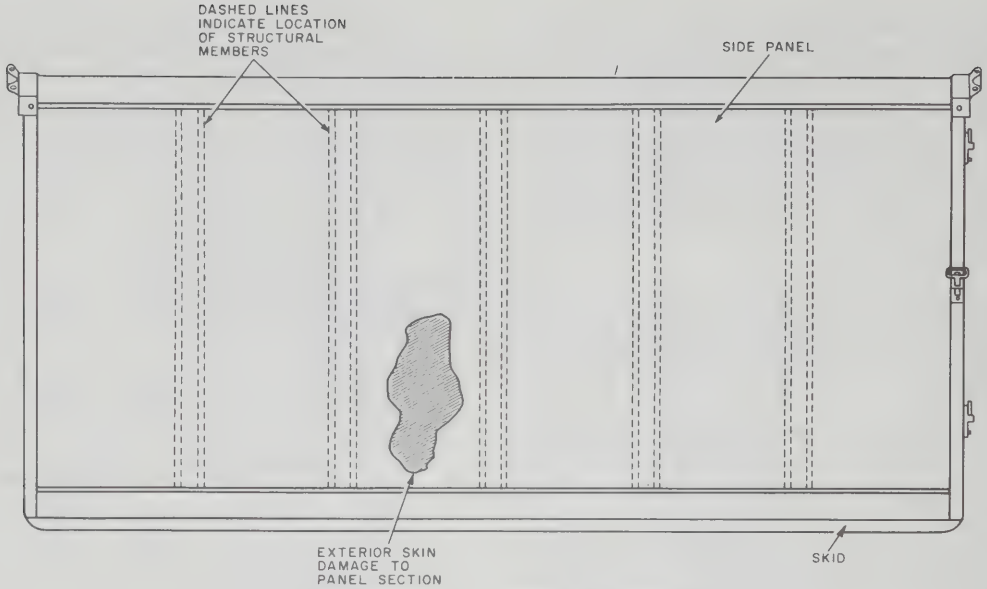
c. Size and cut an overlay (B, fig. 14) from Aluminum Sheet 6061, Federal Specification QQ–A–250/11, Temper T–6, .040 inch thick.

d. Drill No. 30 pop rivet holes, evenly spaced, not greater than 1 inch center-to-center as shown in B, figure 14.

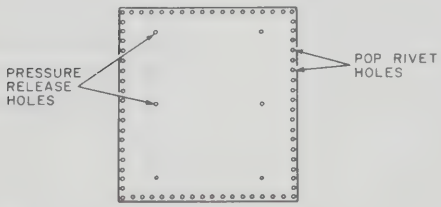
e. Pressure release holes are required in the overlay to release excess foaming material. Use the chart in paragraph 22*d* to determine the number of pressure release holes allowed in an overlay covering a given area.

f. Drill pressure release holes (for 3/16-inch pop rivets) symmetrically spaced in the area of the overlay that does not overlap the skin of the shelter.

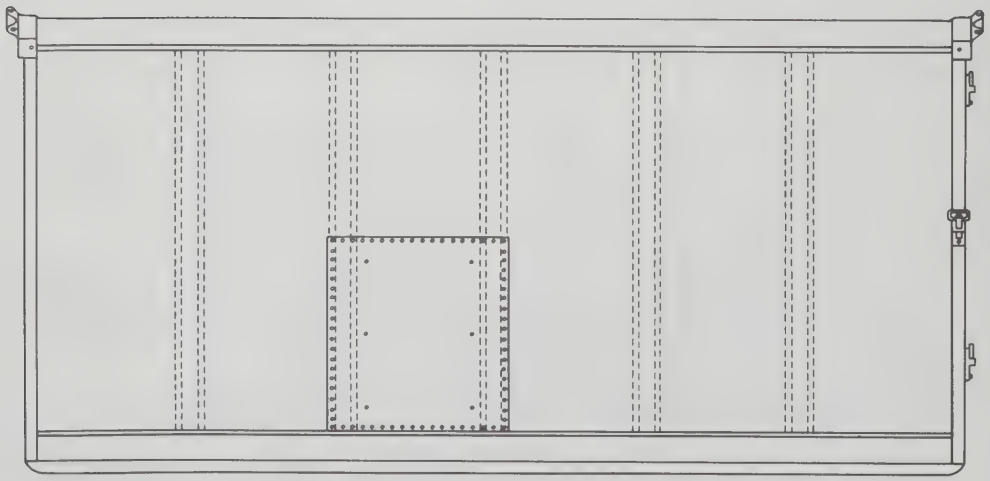
g. Use the overlay as a template, positioned over the opening where the skin and foam-core were removed, to lightly scribe the area of the



A. PANEL SECTION WITH DAMAGED EXTERIOR SKIN.



B. OVERLAY SIZED TO COVER DAMAGED AREA.



C. REPAIRED PANEL SECTION. EL750-240-14

Figure 14. Side view of typical lightweight shelter (S-141/G type) showing repair of damaged panel section.

overlay and mark pop rivet holes on the skin of the shelter.

h. Drill the required pop rivet holes in the skin of the shelter.

i. Remove all paint or foreign matter from the overlap area on the skin of the shelter and an area approximately 1 inch around the scribed mark with emery cloth and the cleaner from the MK–679/G kit.

j. Coat the interior of the opening with the bonding agent contained in the kit.

k. Use sheet metal holders in the pop rivet holes to secure the sides and bottom of the overlay to the skin of the shelter.

l. Mix the required amount of foaming material (para 2*a*, app E).

m. Pour the foaming material, with even distribution, inside the opening through the access provided between the top of the overlay and the skin of the shelter.

n. Immediately use sheet metal holders in the pop rivet holes to secure the top of the overlay of the skin of the shelter.

o. Allow approximately 1 hour for the foaming material to expand and set; then clean off excess foaming material released through the pressure release holes of the overlay.

p. Remove the sheet metal holders, and remove the overlay.

q. Coat the exposed foam-core and overlap area with the bonding agent in the kit.

r. Use pop rivets (dipped in the bonding agent in the kit) and the riveting tool for pop rivets to install the overlay as shown in C, figure 14.

s. Install 3/16-inch pop rivets (dipped in the bonding agent in the kit) in the pressure release holes of the overlay.

t. Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the overlay, and remove excess bonding agent.

u. Prime and paint the repaired surface (para 12).

25. Repair of Complete Puncture

a. Complete Puncture Between Members, Using Block Insulation or cutout and MK–679/G (fig. 15).

(1) Select two aluminum skin patches from the kit that overlap the puncture by 1 inch.

(2) Use one aluminum skin patch as a template positioned over the puncture, and lightly scribe the area of the aluminum skin patch on the exterior skin of the shelter.

(3) Use the reciprocating saw to cut out the entire section (interior and exterior skin and foam-core) approximately 1 inch within the scribed mark (A and B, fig. 15). Evenly trim the sides of the opening.

(4) Select a piece of block insulation from the kit or a cutout of the same size sandwich construction (C, fig. 15).

(5) Size the block insulation or cutout to fit the opening where the skin and foam-core were removed.

(6) Remove all paint or foreign matter from the overlap areas on the skins of the shelter and an area approximately 1 inch around the scribed marks with emery cloth and the cleaner contained in the kit. If a cutout is used, remove all paint and foreign matter from the aluminum skins of the cutout.

(7) Roughen the skin surfaces with coarse grit emery cloth. If a cutout is used, roughen the surfaces of the aluminum skins.

(8) Use the aluminum skin patches as templates to mark pop rivet holes on the interior and exterior skins of the shelter, and drill No. 30 holes in the interior and exterior skins of the shelter.

(9) Coat the overlay area on the interior skin of the shelter with the bonding agent in the kit.

(10) Use pop rivets (dipped in the bonding agent contained in the kit) and the riveting tool for pop rivets to secure one of the aluminum patches to the interior skin of the shelter (C, fig. 15).

(11) Coat the inside of the opening, including the secured patch, with the bonding agent from the kit.

(12) Insert the block insulation or cutout into the opening; be sure that the block insulation or cutout butts up against the secured patch (D, fig. 15).

(13) Coat the exposed side of the block insulation or cutout and the overlap area with the bonding agent in the kit.

(14) Use pop rivets (dipped in the bonding agent from the kit) and the riveting tool for pop rivets to secure the remaining patch to the exterior skin of the shelter.

(15) Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the aluminum skin patches, and remove excess bonding agent.

(16) Prime and paint the repaired surfaces (para 12).

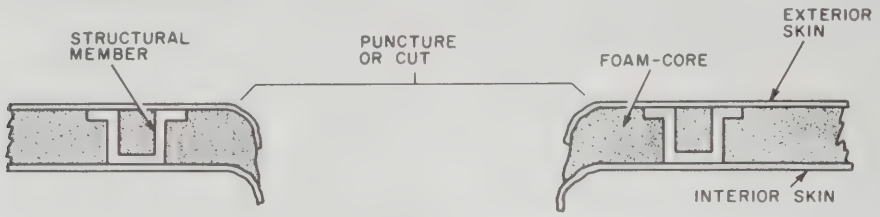
b. Complete Puncture Bridging Member (fig. 16).

(1) Using a circular saw, remove the entire damaged section except for the member.

(2) Cut the damaged member (and thermal barrier) so that the ends project 4 to 6 inches beyond the edges of the opening.

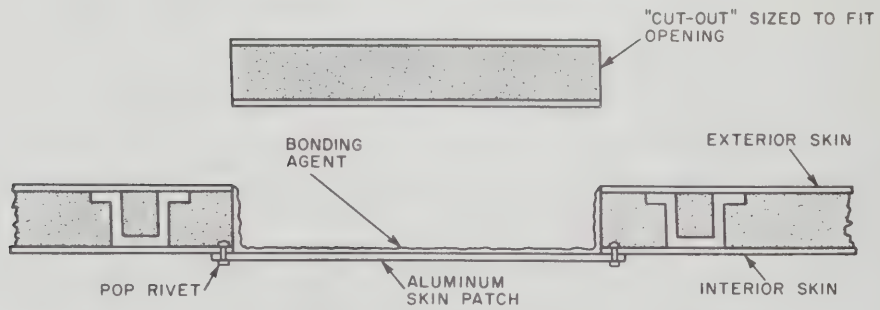
(3) Prepare two skin patches (para 23*a*(1)).

(4) Install one patch on the outer skin using the bonding agent and pop rivets contained in the kit.

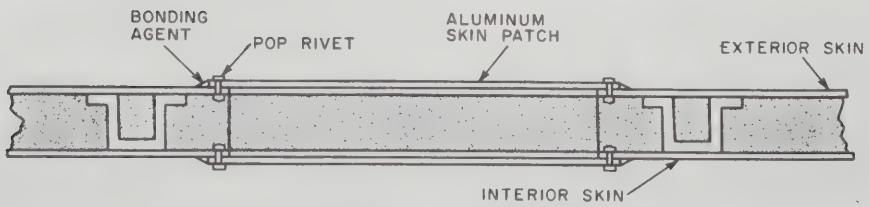


A. COMPLETE PUNCTURE THROUGH SANDWICH CONSTRUCTION.

B. DAMAGED SECTION REMOVED FROM SANDWICH CONSTRUCTION.



C. OPENING PREPARED FOR INSTALLATION OF "CUT-OUT."



D. REPAIRED COMPLETE PUNCTURE

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Figure 15. Cross-sectional views of shelter wall (flat construction) showing repair of complete puncture (not involving a structural member), using cutout.

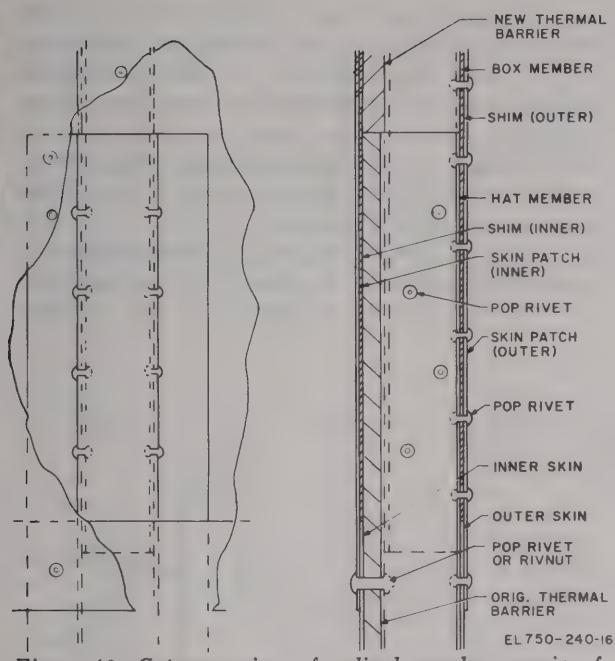

Figure 16. Cutaway view of spliced member repair of complete puncture bridging member.

(5) Perform the procedures per paragraph 23*b*(4) through (9). Reference figure 16 for splicing the member.

c. Flat Surface or Curved Surface at Top of Shelter, Using Foaming Material and MK–679/G (fig. 17).

(1) Perform the procedures in *a*(1), (2), and (3) above by use of A and B, figure 17.

(2) Remove all paint or foreign matter from the overlap areas on the skins of the shelter and an area approximately 1 inch around the scribed marks with emery cloth and the cleaner in the kit.

(3) Roughen the skin surfaces with coarse grit emery cloth.

(4) Use one of the aluminum skin patches as a template to mark pop rivet holes on the interior skin of the shelter and drill No. 30 holes in the interior skin of the shelter.

(5) Coat the overlap area on the interior skin of the shelter with the bonding agent contained in the kit.

(6) Use pop rivets (dipped in the bonding agent in the kit) and the riveting tool for pop rivets and secure one of the aluminum skin patches (standard patch) to the interior skin of the shelter (C, fig. 17).

(7) Pressure release holes are required in the remaining aluminum skin patch (foaming patch) to release excess foaming material. Use the chart in paragraph 22*d* to determine the number of pressure release holes allowed in the aluminum patch covering a given area.

(8) Drill pressure release holes (for 3/16-inch pop rivets) symmetrically spaced in the area of the aluminum skin patch that does not overlap the shelter skin.

(9) Use the foaming patch as a template to mark pop rivet holes in the exterior skin of the shelter, and drill No. 30 holes in the exterior skin of the shelter.

(10) Coat the inside opening, including the standard patch, with the bonding agent from the kit.

(11) Use sheet metal holders in the pop rivet holes to secure the sides and bottom of the foaming patch to the exterior skin of the shelter.

(12) Mix the required amount of foaming material (para 2*a*, app E).

(13) Pour the foaming material evenly inside the opening through the opening provided between the top of the foaming patch and the exterior skin of the shelter (D, fig. 17).

(14) Immediately use sheet metal holders in the pop rivet holes to secure the top of the foaming patch to the exterior skin of the shelter.

(15) Allow approximately 1 hour for the foaming material to expand and set (E, fig. 17); then clean off the excess material released through the pressure release holes of the foaming patch.

(16) Remove the sheet metal holders, and remove the foaming patch.

(17) Coat the exposed foam-core and overlap area with the bonding agent from the kit.

(18) Use pop rivets (dipped in the bonding agent in the MK–679/G) and the riveting tool for pop rivets to install the foaming patch as shown in F, figure 17.

(19) Install 3/16-inch pop rivets (dipped in the bonding agent in the kit) in the pressure release holes of the foaming patch.

(20) Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the aluminum skin patches, and remove excess bonding agent.

(21) Prime and paint the repaired surfaces (para 12).

d. Curved Surface at Bottom of Shelter, Using Foaming Material and MK–679/G (fig. 18).

(1) Select two aluminum skin patches from kit that overlap the puncture by 1 inch.

(2) Shape one aluminum skin patch (standard patch) to the contour of the exterior skin.

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(3) Use the standard patch as a template, and lightly scribe the area of the patch on the exterior skin of the shelter.

(4) Use the reciprocating saw to cut out the entire section (interior and exterior skin, and foam-core) approximately 1 inch within the scribed mark (A and B, fig. 18).

(5) Shape the remaining patch (foaming patch) to the contour of the interior skin, and lightly scribe the area of the patch on the interior skin.

(6) Remove all paint and foreign matter from the overlap areas on the skins of the shelter and an area approximately 1 inch around the scribed marks with emery cloth and the cleaner in the kit.

(7) Use the standard patch as a template to mark and drill No. 30 pop rivet holes in the exterior skin of the shelter.

(8) Coat the overlap area on the exterior skin of the shelter with the bonding agent in the kit.

(9) Use pop rivets (dipped in the bonding

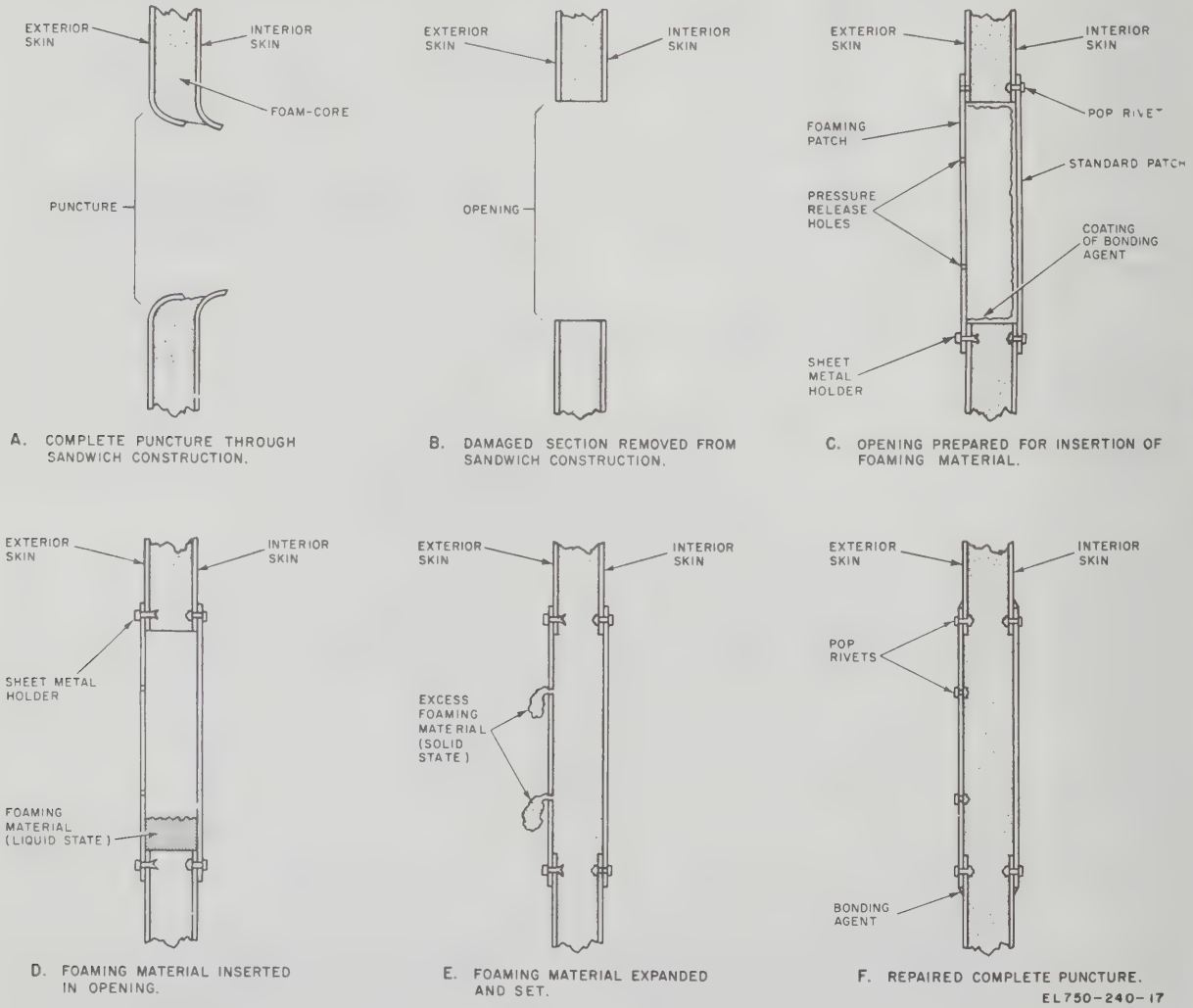

Figure 17. Cross-sectional views of shelter wall (flat construction) showing repair of complete puncture (not involving a structural member) using foaming material.

agent in the kit) and the riveting tool for pop rivets to secure the standard patch to the exterior skin (C, fig. 18).

(10) Pressure release holes are required in the foaming patch to release excess foaming material. Use the chart in paragraph 22*d* to determine the number of pressure release holes allowed in an aluminum skin patch covering a given area.

(11) Drill pressure release holes (for 3/16-inch pop rivets) symmetrically spaced in the area of the foaming patch that does not overlap the interior skin of the shelter.

(12) Use the foaming patch as a template to mark, and drill No. 30 pop rivet holes in the interior skin of the shelter.

(13) Coat the inside of the opening, including the standard patch, with the bonding agent from the kit.

(14) Use sheet metal holders in the pop rivet holes to secure the sides and bottom of the foaming

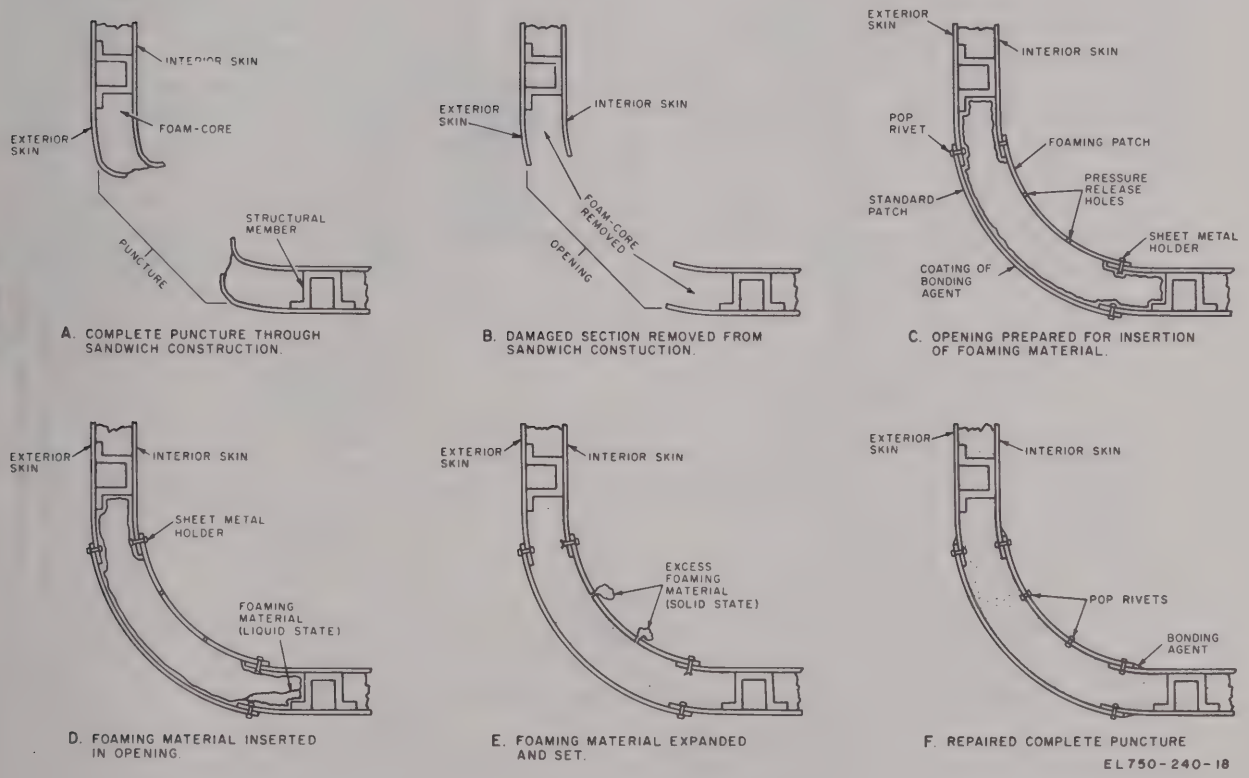

Figure 18. Cross-sectional views of shelter wall (curved construction) showing repair of complete puncture (not involving a structural member), using foaming material.

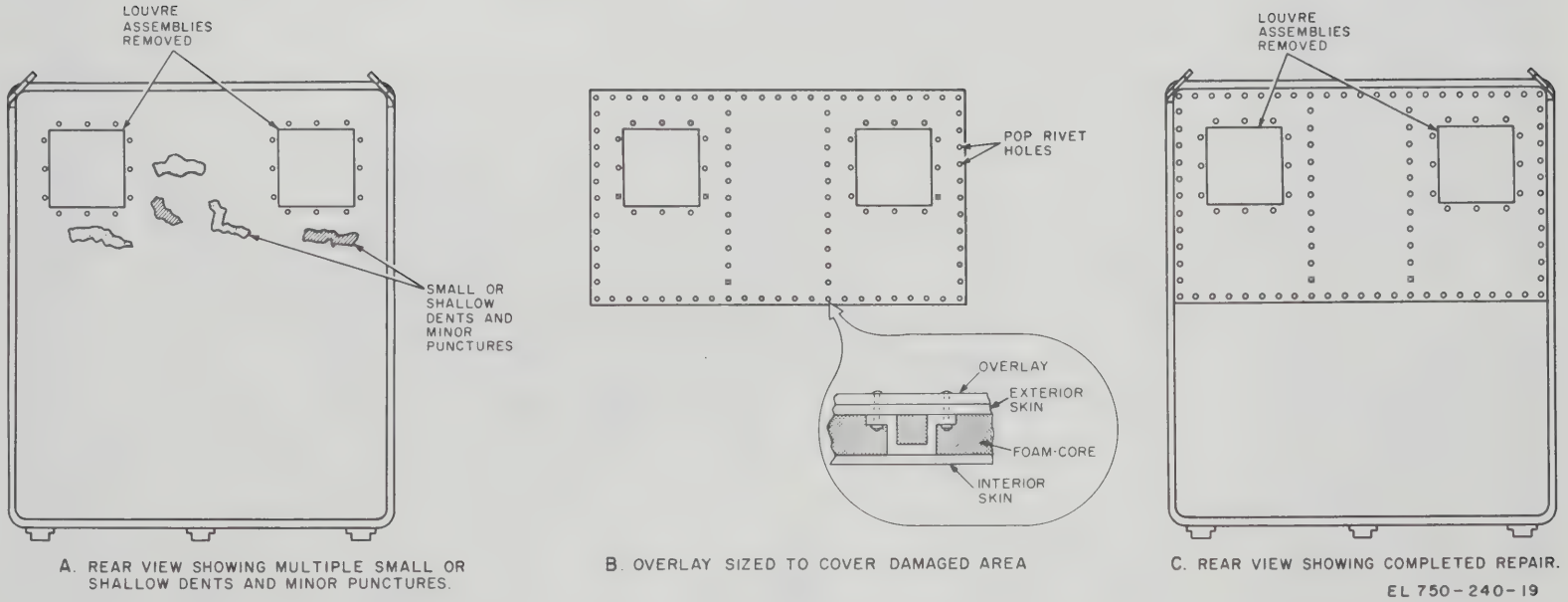
LOUVRE ASSEMBLIES REMOVED
SMALL OR SHALLOW DENTS AND MINOR PUNCTURES
A. REAR VIEW SHOWING MULTIPLE SMALL OR SHALLOW DENTS AND MINOR PUNCTURES.
POP RIVET HOLES
OVERLAY
EXTERIOR SKIN
FOAM-CORE
INTERIOR SKIN
B. OVERLAY SIZED TO COVER DAMAGED AREA
LOUVRE ASSEMBLIES REMOVED
C. REAR VIEW SHOWING COMPLETED REPAIR.
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Figure 19. Rear view of typical lightweight shelter (S-141/G type) showing typical repair of surface with multiple small or shallow dents and minor punctures.

patch to the interior skin of the shelter (C, fig. 18).

(15) Mix the required amount of foaming material (para 2*a*, app E).

(16) Pour the foaming material evenly inside the opening provided between the top of the foaming patch and the interior skin of the shelter (D, fig. 18).

(17) Immediately use sheet metal holders in the pop rivet holes to secure the top of the foaming patch to the interior skin of the shelter.

(18) Allow approximately 1 hour for the foaming material to expand and set (E, fig. 18); then clean off the excess foaming material released through the pressure release holes of the foaming patch.

(19) Remove the sheet metal holders, and remove the foaming patch.

(20) Coat the exposed foam-core and overlap area with the bonding agent in the kit.

(21) Use pop rivets (dipped in the bonding agent in the kit) and the riveting tool for pop rivets to install the foaming patch as shown in F, figure 18.

(22) Install 3/16-inch pop rivets (dipped in the bonding agent in the kit) in the pressure release holes of the foaming patch.

(23) Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the aluminum skin patches, and remove excess bonding agent.

(24) Prime and paint the repaired surfaces (para 12).

26. Repair of Multiple Small or Shallow Dents and Minor Punctures

When an entire surface is damaged by multiple small or shallow dents and minor punctures (A, fig. 19), repair the surface as instructed in *a* through *k* below.

NOTE

Structural strength of floor and roof panels, and compressive strength (in column loading conditions) of side panels depend on an intact bond between the elements of the laminated construction. *Do not* attempt repair of shelters that have sustained impact damage which causes buckling of each side of the laminated construction over the entire length of a panel section (fig. 13). Impact damage that causes buckling of only one side of the laminated construction generally is reparable; follow the procedures in *a* through *k* below.

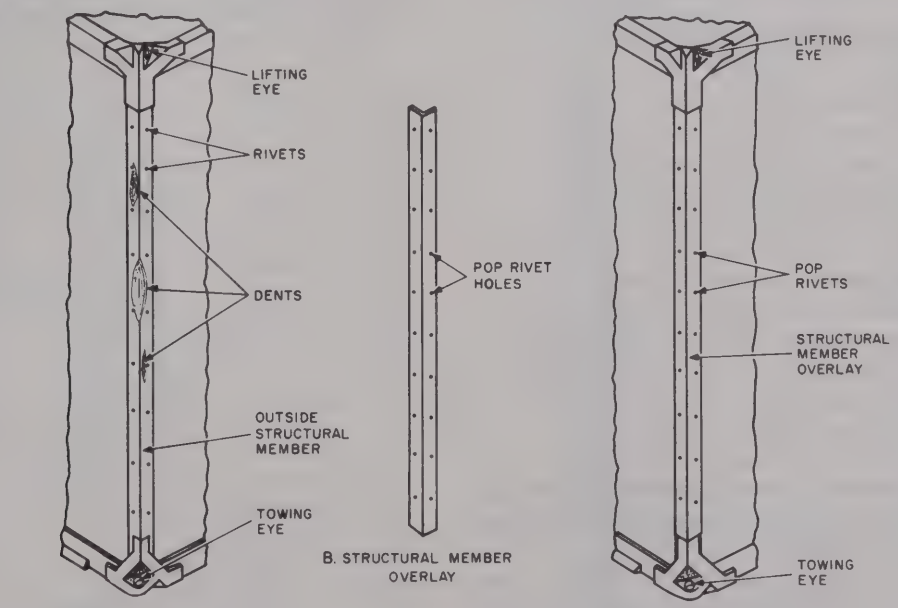

Figure 20. Corner views of typical lightweight shelter (S–141/G type) showing typical repair of outside structural member secured with rivets.

a. Fill in the small or shallow dents and minor punctures (para 20).

b. Remove maintenance parts, such as louver assemblies, that would not allow an overlay to butt up against the shelter skin.

c. Size and cut an overlay (B, fig. 19) from Aluminum Sheet 6061, Federal Specification QQ–A–250/11, Temper T–6, 0.040 inch thick.

d. Determine the size of the pop rivets required, and drill pop rivet holes in the overlay, as indicated in B, figure 19, evenly spaced, not greater than 4 inches center to center.

e. Drill holes in the overlay for installing the maintenance parts.

f. Use the overlay as a template to mark the skin of the shelter, and drill the required pop rivet holes.

g. Coat the skin of the shelter where the overlay will be installed with the bonding agent in the kit.

h. Use pop rivets (dipped in the bonding agent in the kit) and the riveting tool for pop rivets to secure the overlay to the skin of the shelter as shown in C, figure 19.

i. Replace the maintenance parts.

j. Smooth and taper bonding agent (squeezed out during the riveting process) along the edges of the overlay, and remove excess bonding agent.

k. Prime and paint the overlay (para 12).

27. Repair of Outside Structural Members

NOTE

Do not attempt repair of an outside structural member that has sustained impact damage which causes complete buckling of the entire length of the outside structural member. Follow the procedures in *a* or *b* below to repair an outside structural member with a repairable type damage.

a. Structural Member Secured With Rivets, Using MK–679/G.

(1) Fill in the small or shallow dents and minor punctures (para 20).

(2) Drill out the rivets (A, fig. 20).

(3) Prepare a structural member overlay (B, fig. 20) ; use material with the same specifications as the original structural member.

(4) Mark and drill pop rivet holes in the structural member overlay in accordance with the holes in the original structural member.

(5) Coat the inside surface of the structural member overlay with the bonding agent from the kit.

(6) Use appropriate size pop rivets (dipped in the bonding agent in the kit) and the riveting tool for pop rivets to secure the structural member overlay to the original structural member as shown in C, figure 20.

(7) Clean off excess bonding agent (squeezed out during the riveting process).

(8) Prime and paint the structural member overlay (para 12).

b. Structural Member Secured With Weld.

(1) Fill in the small or shallow dents or minor punctures (para 20).

(2) Prepare a structural member overlay (B, fig. 20) ; use material with the same specifications as the original structural member.

(3) Drill pop rivet holes in the structural member overlay evenly spaced, not greater than 4 inches, center to center.

(4) Use a structural member overlay as a template to mark the original structural member, and drill pop rivet holes in the original structural member.

(5) Perform the procedures in *a*(5) through (8) above.

28. Replacing Damaged Shelter Skids (fig. 21)

When it is necessary to replace a damaged shelter skid that was originally riveted to the shelter, use

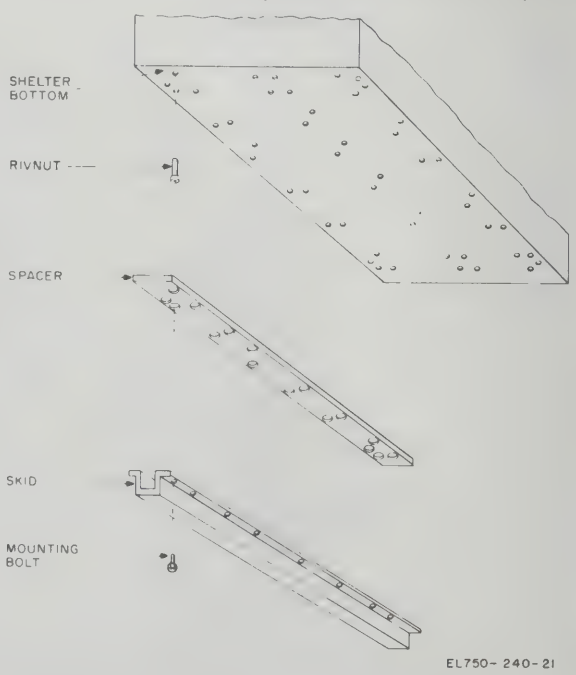

Figure 21. Shelter skid replacement, exploded view.

mounting holes, if feasible, to secure the new skid to the shelter. Follow the procedures in *a* through *f* below when replacing damaged shelter skids.

a. Drill out the 5/16-inch rivets, and remove the shelter skids.

b. Use 5/16-inch rivnuts of appropriate length, and install the rivnuts (dipped in the bonding agent in the MK-679/G) in the shelter bottom with the applicable rivnut heading tool as instructed in paragraph 34.

c. Prepare a sheet aluminum spacer 0.001 to 0.003 inch thinner than the head of the rivnut.

d. Use the skid as a template to mark the spacer, and drill holes equivalent to the diameter of the rivnut head.

e. Position the spacer and skid, and secure them by tightening the mounting bolts into the rivnuts.

f. Prime and paint the exposed aluminum surfaces (para 12).

29. Replacing Damaged or Worn Floor Tread

If the shelter has an overlay floor tread, use the following procedures to repair damaged floor covering of shelters.

a. Remove floor tread completely.

b. Clean any excess adhesive from the floor using Methyl Ethyl Ketone Cleaner, ½ Gallon Can (NSN 6810-00-687-8429), 1 Gallon Can (NSN 6810-00-281-2785).

c. Paint the floor using Zinc Chromate Primer, 1 Pint Can (NSN 8010-00-835-2114), 1 Gallon Can (NSN 8010-00-515-2208), 16 oz Aerosol Can (NSN 8010-00-297-0593).

d. Finish coat using Lusterless Gray Enamel, 1 Quart Can (NSN 8010-00-900-1621), 1 Gallon Can (NSN 8010-00-900-1622).

e. Cut to size and install one of the below listed floor coverings. Use no adhesive.

(1) Matting, floor, rubber,d 1/8" thick x 36" wide, 50 yard roll (NSN 7220-00-254-4240).

(2) Matting floor, rubber, 3/16" thick x 36" wide, 25 yard roll (NSN 7220-00-965-4699).

f. All materiel listed in *b* through *e* above is available through normal supply channels.

30. Removing Towing and Lifting Eyes

When damaged towing or lifting eye fitting is removed, the following shall apply:

a. If the original was installed with adhesive on the inner surface, the repaired fitting or the replacement shall be installed with its inner surfaces completely coated with adhesive contained in the MK-679/G.

b. If the original was not installed with adhesive, the repaired fitting or the replacement shall be installed with its inner surfaces completely coated with sealer contained in the MK-679/G.

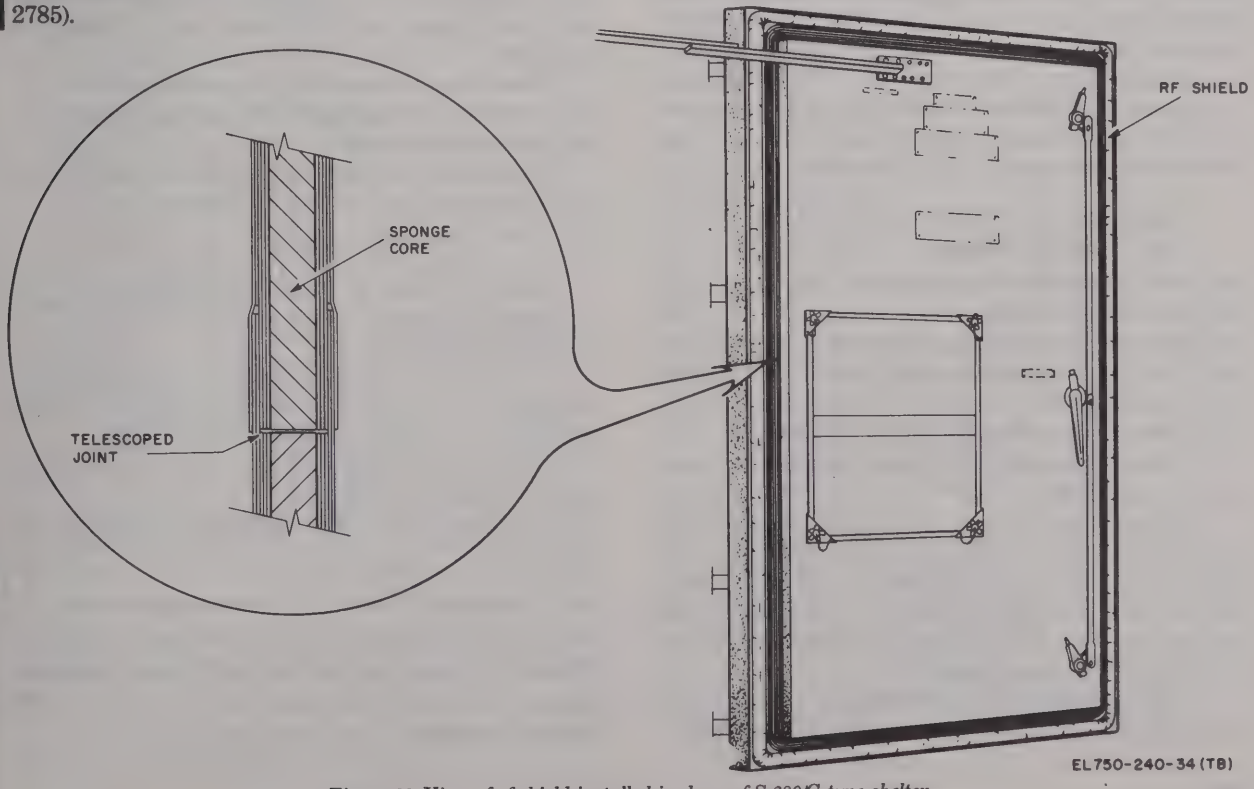

Figure 22. View of rf shield installed in door of S-380G type shelter.

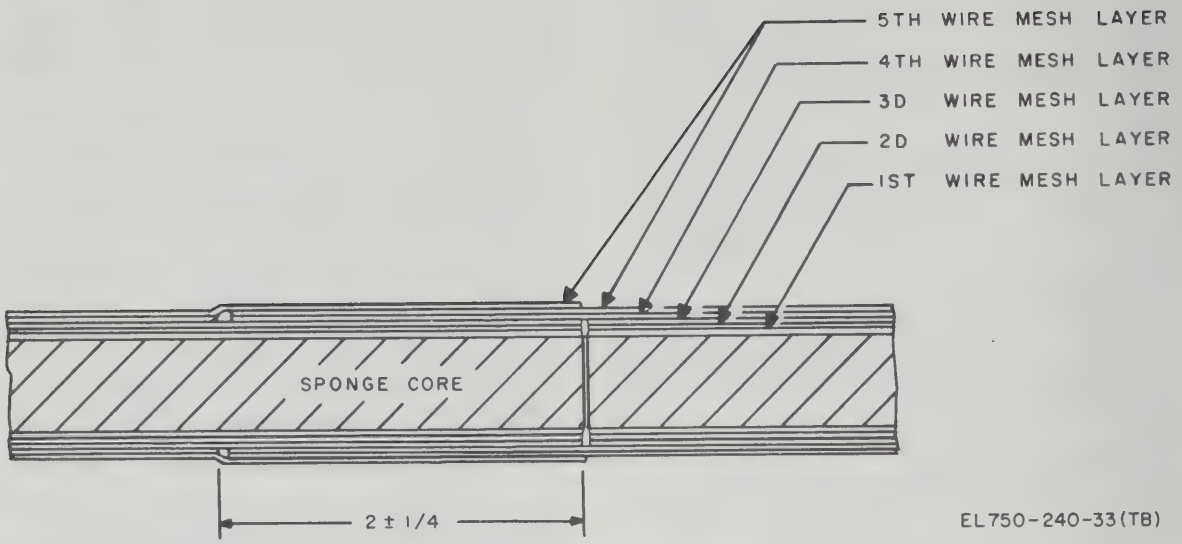

Figure 23. Rf shield telescoped joint.

coated with sealer contained in the MK–679/G.

31. Replacing Hinges on S–141/G

The doors on all *round corner* type S–141/G shelters manufactured by Craig Systems, Inc., shall be refastened with new hinges (FSN 5340–802–7407). Both lower hinges shall be replaced, as well as the top one on the upper door. In addition, the new hinge shall be added directly above the louver assembly on the upper door. Sleeves should be installed around the bolts through the inner door skin and a plate added over the skin in this area to add strength to the assembly.

32. Replacing Rf Filters on S–250/G, S–280/G, and S–318/G Shelters

When the replacement of an rf filter is necessary, the following shall apply:

a. Remove the threaded fasteners securing the filter in place (rivets secure the filter in the S–318/G shelter).

b. Remove the filter and wire mesh tape.

c. Clean the surfaces of paint, excess adhesive, and foreign matter.

d. Install new wire mesh tape on all surfaces between the flange on the frame and filter.

e. Using holes in the flange as a template, drill and fasten a new filter in place with screws, nuts, and lockwashers (use rivets when securing filters in the S–318/G, para 40*c*).

f. Seal the outer edges of joints between the filter and flange with sealant from the MK–679/G.

33. Replacing Rf Shield on S–250/G, S–280/G, and S–318/G

When the replacement of the rf shield is necessary, the following shall apply:

a. Remove the damaged shield, and clean the surface of paint and foreign matter.

b. Install the new rf shield, making sure that the shield shape at the corners is as shown in figure 22.

c. The telescoped joints (fig. 22) shall be approximately midway up the hinge side of the door and the emergency exit.

d. The procedure for making a telescoped joint in the rf shield (fig. 23) is as follows:

NOTE

When cutting a shield, allow an additional 2 inches to overall length for the telescoped joint.

(1) On one end of the shield, pull back layers 5 and 4 approximately 2½ inches and cut 2 inches off layers 3, 2, and 1 and the sponge core.

(2) On the other end, pull back layer 5 and cut off 2 inches of layer 4.

(3) Join the ends together as shown in figure 23.

34. Replacing Rivnuts or Fastening Devices

Follow the procedures in *a* below when replacing rivnuts or fastening devices, and follow the procedures in *b* below to insure that all rivnuts are properly seated.

a. Replacement Procedure.

(1) Drill out the damaged rivnut or fastening device with an appropriate-sized drill (*b* below).

(2) Use the *depth* and angle gage in the TK–144/G to measure the thickness of the material where the rivnut will be installed.

CAUTION

This measurement determines the *grip range* requirement of the replacement rivnut and should account for airgaps, paint, or burrs in the thickness of the material which cannot be removed.

(3) Select the proper *grip range* replacement rivnut, and use the applicable rivnut heading tool to install the rivnut.

CAUTION

When securing maintenance parts to the rivnuts, use the torque indicating wrench and *do not tighten the capscrews beyond the maximum assembly tightening torque* (*b* below).

b. Seating Test. When properly seated the rivnuts should not turn when the torque load listed in the table is applied. To test for proper seating use a hexagonal nut threaded on a hexagonal head screw. Turn the screw into the rivnut six (6) complete turns. Hold the screw stationary and tighten the nut down against the rivnut head, as a jam nut. Apply the required torque in the clockwise direction using the torque wrench in TK–144/G. Do not exceed the maximum assembly torque shown in the table. Repeat the test in the counterclockwise direction.

Rivnut size	*Drill size*	*Seating test torque (pound-inches)*		*Maximum assembly torque (pound-inches)*	
		Steel	*Aluminum*	*Steel*	*Aluminum*
#6	#12	13	4	29	18
#8	#2	21	9	47	30
#10	E	26	10	69	37
¼	Q	66	29	127	81
5/16	Z	111	49	232	139
⅜	12.5 mm	193	83	344	220

35. Calking Shelter Seams

NOTE

All seams should not exceed a ⅜-inch width and should be smoothly and uniformly applied. Inspect all shelter seams, and use either silastic or polysulfide sealant to calk any seam that requires calking as follows:

a. When using silastic sealant, use the tube spout of the tube containing the silastic sealant to apply the seam.

b. When applying polysulfide sealant (para 3, app E), use the calking gun from the MK–679/G and follow the procedures below:

(1) Remove all loose material from seams.

(2) Position the calking gun at approximately a 45° angle with respect to the surface.

(3) Slowly operate the trigger of the calking gun while moving the nozzle at a continuous pace. The size of the bead deposit depends on the speed of application.

(4) Keep the size of the bead ⅜-inch wide and approximately 3/32-inch thick at the highest point.

(5) Dip a finger in a strong soap solution to smooth uneven calking beads.

(6) Eliminate all air bubbles in the calking seam. Air bubbles in the calking seam are indicated by pinholes.

(7) Clean and remove excess calking compound.

(8) Allow the calking seam to set for 24 hours at 70° F. and paint the seam (para 12).

c. Use masking tape on long runs to insure a uniform seam width.

36. Sealing Strips

All four horizontal sealing strips (aluminum) on the two side panels of all *round-corner* shelters manufactured by Craig Systems, Inc., must be replaced with a strip from Aluminum Alloy, 6061–T6, rectangular bar, 0.125 inch thick by 2 inches wide (QQ–A–250/11). The new strip shall be secured with closed end 3/16-inch pop rivets with staggered spacing 1½ inches on center.

37. Marking Shelter

Stencil the following warning notice on all sides of the shelter, approximately at eye level, in conformance with MIL–M–13231:

WARNING

Handle by overhead lifting eyes only, unless properly crated or pallet mounted for fork lifting.

SECTION VII

DEPOT OVERHAUL STANDARDS

38. Applicability of Depot Overhaul Standards

The tests outlined in this section are designed to measure the mechanical performance capability of a repaired lightweight shelter. Repaired lightweight shelters that meet the minimum standards stated in the tests will furnish satisfactory performance equivalent to that of new equipment. Applicable procedures of the depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355–1, TB SIG 355–2, and TB SIG 355–3 form a part of the requirements for testing this equipment. Tests for repaired lightweight shelters are divided into two categories: The test in *a* below apply to repairs or replacement of specific maintenance items; the tests in *b* below apply to all lightweight shelters in addition to the tests indicated in *a* below. These tests must be performed in the given sequence.

NOTE

Electrical and electronic performance requirements for shelter-contained equipments are included in the appropriate equipment technical manual.

a. Category 1 Tests.

Item	*Test paragraph*
Lifting eye	*a*
Towing eye	*b*
Any part secured with rivets	*c*
Locking and latching devices	*d*
Skin patches secured with rivets	*e*
Rivnuts and threaded fastening devices	*f*
Mountings	*g*
Performed rubber and gasket material and sealing strips.	*h*
Placards	*i*
Stenciling	*j*
Nameplates	*k*
Aircraft loading data plate	*l*
Floor tread	*m*
Finish protective	*n*
Final paint film	*o*

b. Category 2 Tests.

Item	*Test paragraph*
Watertightness	*a*
Fording	*b*
Lubrication	*c*
Storage	*d*
Lifting and tiedown provisions	*e*
Radiofrequency interference suppression	*f*
Workmanship	*g*
Classification of defects	*h*

39. Test Facilities

a. Test fixture for performing lifting eye and towing eye load test.

b. Fording tank.

c. Facilities for performing watertightness test.

d. Dynamometer or crane scale.

40. Test for Repaired or Replaced Maintenance Items

NOTE

When performing the tests below, thoroughly check the repaired or replaced maintenance item and the surrounding area of the shelter. Cleaning processes performed during repair or replacement should have no bad effects on the lightweight shelter.

a. Lifting Eye. Each lifting eye should be subjected to a tensile load, applied in at least three separate directions. The planes of the loading directions shall be as shown in A, figure 24. The test shall be made with a suitable dynamometer having an accuracy of ½ of 1 percent of the indicated scale reading. The test will result in no permanent deformation of the lifting eye assembly or associated shelter area. Listed below are the applicable tensile loads for each shelter:

Shelter	Tensile load (lb)
S–141/G bearing order number prior to 1963	8,000
S–141/G bearing order number after 1963	11,000
S–144/B	3,000
S–250/G	5,000
S–280/G	11,000
S–280/G where the pull involves a towing eye	8,000
S–318/G	3,000

b. Towing Eye. Each towing eye shall be subjected to a tensile load applied in at least three separate directions. The planes of the loading directions shall be shown in B, figure 24. The test shall be made with a suitable dynamometer having an accuracy of ½ of 1 percent of the indicated scale reading. The test will result in no permanent deformation of the towing eye assembly or associated shelter area. Listed below are the applicable tensile loads for each shelter:

Shelter	Tensile load (lb)
S–141/G bearing an order number prior to 1963.	8,000
S–141/G bearing an order number after 1963	11,000
S–144/G	3,000
S–250/G	5,000
S–280/G	8,000
S–318/G	3,000

c. Any Part Secured With Rivets. The thickness of countersunk metal which accepts the heads of flush rivets should be not less than the height of the rivet heads. The distance from the center of the rivet holes to the edge of the material in which the holes are formed should be at least 1½ times the rivet diameter.

d. Locking and Latching Devices. A test should be made on the emergency exit provision from inside the shelter when the outside is padlocked. All parts should be checked to see that they are applied in a workmanlike manner and operate freely. No difficulty should be experienced testing the emergency exit provision.

e. Skin Patches Secured With Rivets. Each riveted skin patch should show no sign of distortion or warp. All skin patches should match the original contour of the shelter skin and be squared to within one-sixteenth inch of nearest line of reference.

f. Rivnuts and Threaded Fastening Devices. All replaced rivnuts and threaded fasteners should be monitored and tested during installation. Refer to paragraph 34 for additional instructions.

g. Mountings. Brackets, lugs, flanges, inserts, bolts, and other mounting arrangements shall be such as to retain components and parts securely when the shelter is subjected to specific service conditions.

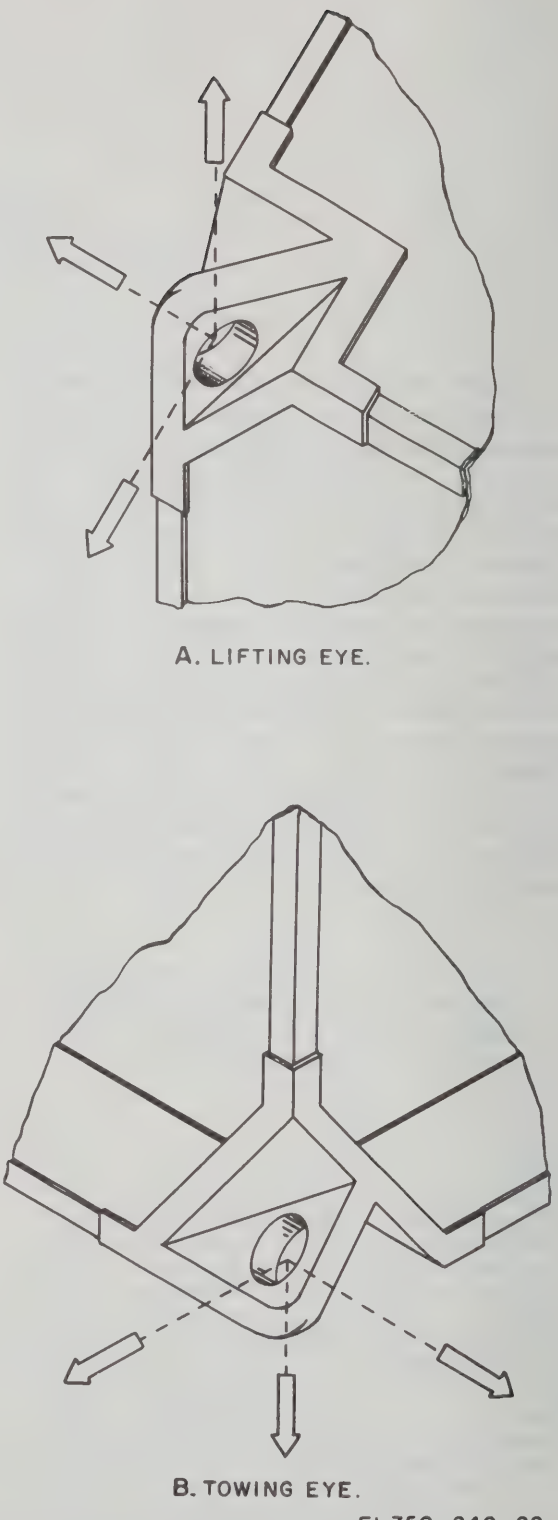

Figure 24. Lifting and towing eye pull load test directions.

h. Preformed Rubber, Gasket Material, and Sealing Strips. Preformed rubber, gasket material, and sealing strips should be neatly and evenly applied. A coating of talcum powder will be applied to the exposed surfaces to prevent mating parts from sticking to each other.

i. Placards. Each shelter should be appropriately marked with suitable instructions for normal transit (para 37) and specific loading or unloading instructions for a particular type of transporting equipment.

j. Stenciling. Stenciled markings should conform to MIL–M–13231.

k. Nameplates. All nameplates should conform to MIL–STD–130A.

l. Aircraft Loading Data Plate. Aircraft loading data plates should bear correct loading information for the repaired lightweight shelter in conformance with SD–C–82768.

m. Floor Tread. Replaced floor tread should be neatly and evenly applied (para 29) and withstand a dielectric test at 500 volts alternating current (ac) root mean square (rms).

n. Finish Protective. All reworked surface areas should have protective finish applied in accordance with MIL–M–14072, except solar-heat reflecting paint shall have been used when appropriate (para 12).

o. Final Paint Film. The final paint film on exterior surfaces and the door interior shall be green color (olive drab), semigloss finish (compatible with the original finish), except for the floor which shall be lusterless gray. Colors used shall be colors currently acceptable for depot refinishing of signal equipment. Retouched surfaces shall match the original finishes. All paint must conform to MIL–F–14072 except that solar heat reflecting paint shall have been used when appropriate (para 12).

41. Test for Each Repaired Lightweight Shelter

a. Watertightness. Each of the five exposed surfaces of the shelter shall meet the watertightness test requirements appearing in applicable military specification (MIL–S–52059B(EL), S–141/G; MIL–S–52060A (Sig C), S–144/G; MIL–S–55286(EL), S–280/G; MIL–S–55429(EL), S–318/G; SC–A–46901, S–250/G).

b. Fording. The shelter, as prepared for transportation on a military cargo truck, should be immersed in water to a depth of 21 inches for S–141/G, S–144/G, and S–280/G shelters and a depth of 30 inches for S–250/G and S–318/G shelters measured from the bottom of shelter skids. No special fording kits or additional calking, taping, etc., will be used during this test. There should be no leakage or damage to the shelter during this test. The shelter shall be immeresd for 1 hour.

c. Lubrication. All vent hinges and door mechanisms shall be disassembled and the wearing surfaces cleaned and lubricated as indicated in paragraph 11. No door latch shall exhibit any binding. Broken latch parts shall be replaced.

d. Storage. Temperature and humidity cycling of shelters results in an accumulation of moisture inside the shelter which is harmful to equipment in the shelter. Moisture accumulation shall be kept to a minimum by keeping shelter doors and vents open during all periods of closed storage. During storage in open areas, vents shall be left open.

e. Lifting and Tiedown Provisions.

(1) *S–141/G and S–280/G shelters.* These shelters shall be provided with a sling, multiple leg, SC–D–36423 (FSN 5410–805–5533).

(2) *S–144/G shelter.* The S–144/G shelter shall be provided with a sling, multiple leg, SC–C–36302 (FSN 5410–774–6108).

(3) *S–250/G shelter.* The S–250/G shelter shall be provided with a sling, multiple leg, SM–D–649952.

(4) *S–318/G shelter.* The S–318/G shelter shall include a sling, multiple leg, SM–B–564739.

f. Radiofrequency Interference Suppression. The shelter must meet the rfi suppression requirements specified in MIL–STD–285. See Note, paragraph 17.

g. Workmanship Standards. Use the chart below to determine the minimum acceptable standards of workmanship on a repaired lightweight shelter.

Item	*Minimum acceptable standard*
Assembled parts	....All parts should be assembled in the proper sequence with no missing, inoperative, defective, bent, broken, or otherwise damaged part which could cause malfunction or become inoperative or unsafe for service.
Hinges	.....All hinges should be of the proper size and type to accomplish their intended function without premature breakdown, with no noticeable interference, binding, or galling. Surfaces should be free of rust with no discoloration of the finish.
Latching devices and fasteners.	All threaded parts or devices should be of the proper type, class, and

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size with no crossed threads, or burred or mutilated heads. All screws in tapped parts should engage for a distance at least equal to the diameter of the screw. There should be no evidence of loose lockwashers or warpage or distortion of mating parts.

Skin patches .....All skin patches should be properly bonded and secured to the skin surface with no evidence of irregularities in securing devices which would produce localized stresses resulting in distortion or warping. All skin patches should be squared to within one-sixteenth inch of nearest edges.

Corrosion .....All surfaces of the shelter should be free of corrosion before final finish is applied.

Riveting .....There shall be no evidence of looseness, horizontal to the plane of the mating surfaces from undersized rivet shank diameter or oversized holes. There shall be no evidence of looseness, vertical to the plane of the mating surfaces from rivets not tightly seated against bearing surfaces. Distortion or warping of mating surfaces should not exceed one thirty-second inch, and there should be no foreign material such as metal chips or dirt between riveted surfaces.

Hardware finishes ..All hardware finishes should be of the proper color and should extend evenly throughout the finished area with no debris, burrs, blisters, gouge marks, checks, pits, or residuals of corrosive processing agents.

Painting .....All finishes should be of the proper color and adhesion with no blisters, pits, chips, cracks, flaking, or unsightly scratches. Finishes should provide adequate coverage, with no run marks, orange peel, or overspray marks and show no evidence of dirt or other foreign matter embedded in the coating.

Casting .....All castings should be free from surface cracks, porosities, blowholes, discontinuities, shrinkage, unsightly tool marks, recesses, sharp corners and inadequate fillets.

Marking .....All marking should be correct, legible, properly oriented, and in complete view. All marking materials should be of a permanent type.

Dimensions .....All dimensions should be within the allowable tolerances indicated in the Signal Corps drawing for the particular shelter.

h. Classification of Defects (Visual and Mechanical).

Classification		*Defects*
Major	1.	Aircraft loading data plate, instructions, or nameplate omitted, incorrect, or illegible.
	2.	Dimensions not per outline drawing.
	3.	Finish—wrong color, gloss, adhesion, or wrong type.
	4.	Welds—cracked or porous.
	5.	Skids damaged or not properly attached.
	6.	Towing eyes damaged or not properly attached.
	7.	Lifting eyes damaged or not properly attached.
	8.	Floor covering as installed has gaps in seams between adjacent panels, and bubbles, cuts, or slits.
	9.	Drain plug missing or damaged.
	10.	Rubber gaskets or door and covers loose or missing.
	11.	Padlock and keys missing.
	12.	Lift and tiedown assembly missing, damaged, or of wrong directions.
	13.	Panels have delaminated areas, punctures, or other damage.
	14.	Mounted member centerlines not properly marked or located.
	15.	Roof access steps omitted or damaged.
Major	16.	Roof band hold omitted or damaged.
	17.	Provision for attachment of dolly and lifting devices omitted or inadequate.
	18.	Provision for shielding inadequate.
	19.	Doors and covers do not operate or fit.
	20.	Crevices, hollows, pockets, etc, included in design.
	21.	Door hinge parts removable from outside the shelter.
	22.	Door stop damaged or not properly installed.
Minor	1.	Fasteners, cover stops loose or damaged.
	2.	Inlet filter assembly improperly fitted.
	3.	Doors and covers not easily operable.
	4.	Finish-abrasions or scratches.
	5.	Drain plug not captivated.
	6.	Roof steps and handhold not easily operable.

APPENDIX A

APPLICABLE REFERENCES

1. Military Standards

a. MIL–STD–108E, Definitions of the Basic Requirements for Enclosures for Electric and Electronic Equipment.

b. MIL–STD–130C, Identification Marking of U. S. Military Property.

c. MIL–STD–285, Military Standard Attenuation Measurements for Enclosures, Electromagnetic Shielding, for Electronic Test Purpose, Method of.

2. Military Specifications

a. MIL–C–3774A, Crates, Wood; Open 12,000 and 16,000 Pound Capacity.

b. MIL–E–46061(MO), Enamel, Camouflage Solar and Heat Reflecting.

c. MIL–F–14072(Sig C) Finishes for Ground Signal Equipment.

d. MIL–M–13231A(Sig C) Marking of Electronic Items.

e. MIL–S–52059(EL), Shelter, Electrical Equipment S–141/G.

f. MIL–S–52060A(Sig C), Shelter, Electrical Equipment S–144/G.

g. MIL–S–55286(EL), Shelter, Electrical Equipment S–280/G.

h. MIL–S–55429A(EL), Shelter, Electrical Equipment S–318/G.

i. QQ–A–200/8 Aluminum Alloy Bar, Rod, Shapes, and Tube, Extruded.

j. QQ–A–250/11 Aluminum Alloy 6061, Plate and Sheet.

k. TT–E–516, Federal Specification Enamel, Lusterless, Quick Drying Styrenated Alkyd Type.

l. TT–E–527, Federal Specification Enamel, Lusterless Gray.

m. ZZ–M–71d, Federal Specification Matting, Rubber and Vinyl.

3. Federal Standard

595, Colors.

4. Supply Bulletin

SB 708–800–1, Screw-Thread Standards for Federal Services, 1957. Part I: Unified, American, American National, and National Miniature Threads (National Bureau of Standards Handbook H28 (1957).

5. Signal Corps Drawings

a. ES–D–196280 Shelter Outline for S–318/G.

b. ES–D–196313 Test Weight Assembly for S–318/G.

c. SC–A–47794C Wood Guide (Plywood)

d. SC–C–36302 Hold Down Assembly for S–144/G.

e. SC–D–33752 Test Load Assembly for S–144/G.

f. SC–D–35375 Shelter S–144/G Outline Dimensions.

g. SC–D–36423 Hold Down Assembly for S–141/G.

h. SC–D–76482 Shelter S–141/G Outline Dimensions.

i. SC–D–82769 Plate, Aircraft Loading Data.

j. SC–D–95894 Test Load Assembly for S–141/G.

k. SC–D–144516 Shelter S–280/G Outline.

l. SC–D–351469 Test Load Assembly for S–280/G.

m. SC–DL–165489 Shelter Electrical Equipment S–280/G.

n. SC–DL–563500 Shelter Electrical Equipment S–250/G.

o. SM–C–564739 Lifting and Tiedown Assembly for S–318/G.

p. DL–SC–A–621049 Mod. Kit, R.F.I., MK–1080/G.

6. Indexes of Publications

a. DA Pam 310–4. Refer to the latest issue of DA Pam 310–4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310–7. Refer to DA Pam 310–7 to determine whether there are modification work orders (MWO's) pertaining to the equipment. Perform all applicable modification work orders pertaining to the lightweight shelters before making the test specified.

7. Technical Bulletins

a. TB SIG 355–1, Depot Inspection Standard for Repaired Signal Equipment.

b. TB SIG 355–2, Depot Inspection Standard for Refinishing Repaired Signal Equipment.

c. TB SIG 355–3, Depot Inspection Standard for Moisture and Fungus Resistant Treatment.

8. Technical Manuals

a. TM 11–5410–205–12P, Operator and Organizational Maintenance Repair Parts and Special Tool Lists: Shelters, Electrical Equipment S–144/G, S–144A/G, S–144B/G, and S–144C/G.

b. TM 11–5410–205–35P, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists: Shelters, Electrical Equipment S–144/G, S–144A/G, S–144B/G, and S–144C/G.

c. TM–11–5410–206–12P, Operator and Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart: Shelter, Electrical Equipment S–141/G.

d. TM 11–5410–206–35P, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists: Shelter, Electrical Equipment S—141/G.

e. TM 11–5410–212/15P, Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists: Shelter, Electrical Equipment S–318/G.

f. TM 11–5410–213–15P, Operator, Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tools List: Shelter, Electrical Equipment S–280A/G and S–280B/G.

APPENDIX B

IDENTIFYING FEATURES OF LIGHTWEIGHT SHELTERS

Use figures 25 through 29 to identify lightweight shelters.

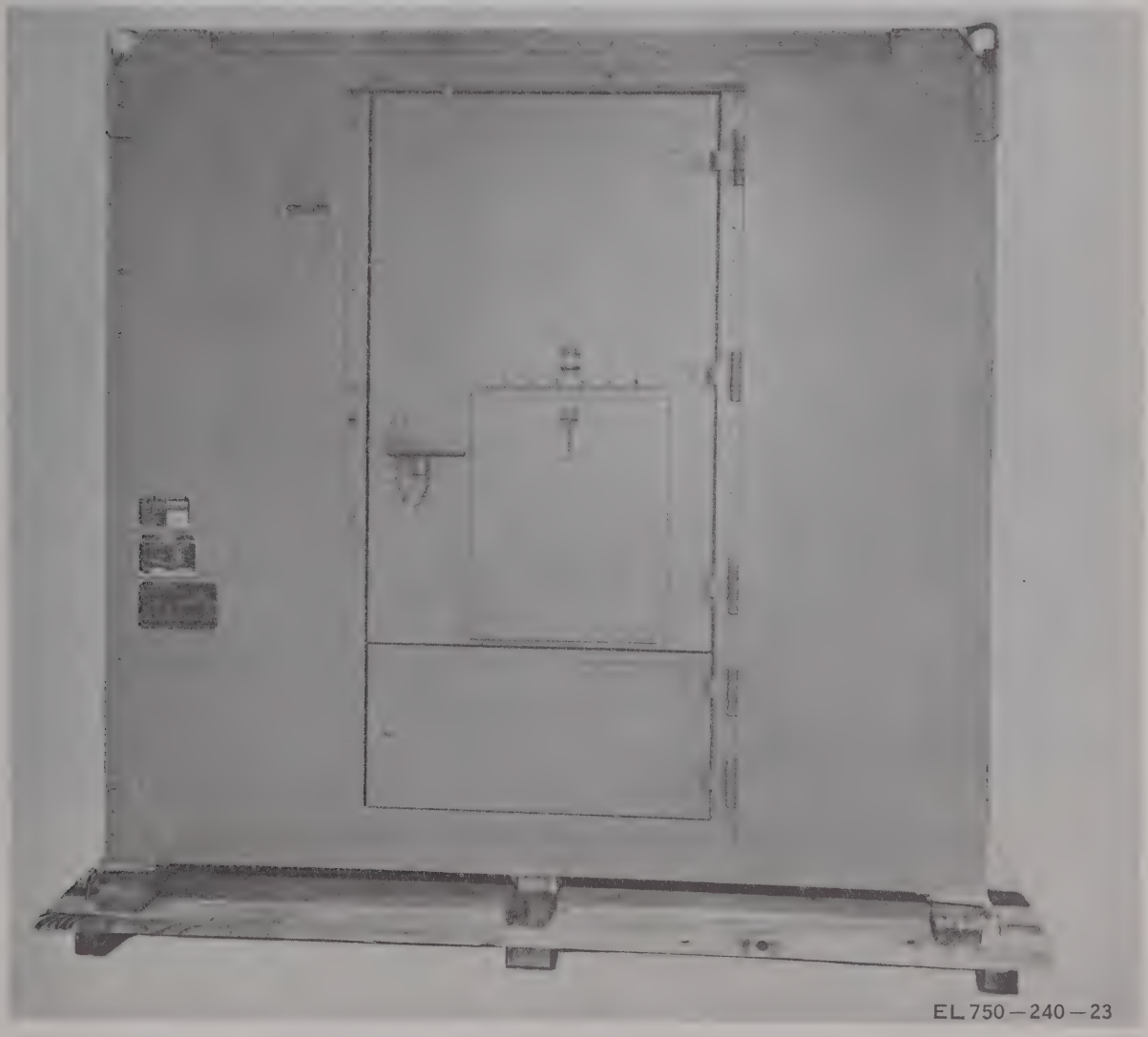

Figure 25. Shelter, Electrical Equipment S-141/G, front panel identifying features.

Figure 26. Shelter, Electrical Equipment S–144/G, front and side panel identifying features.

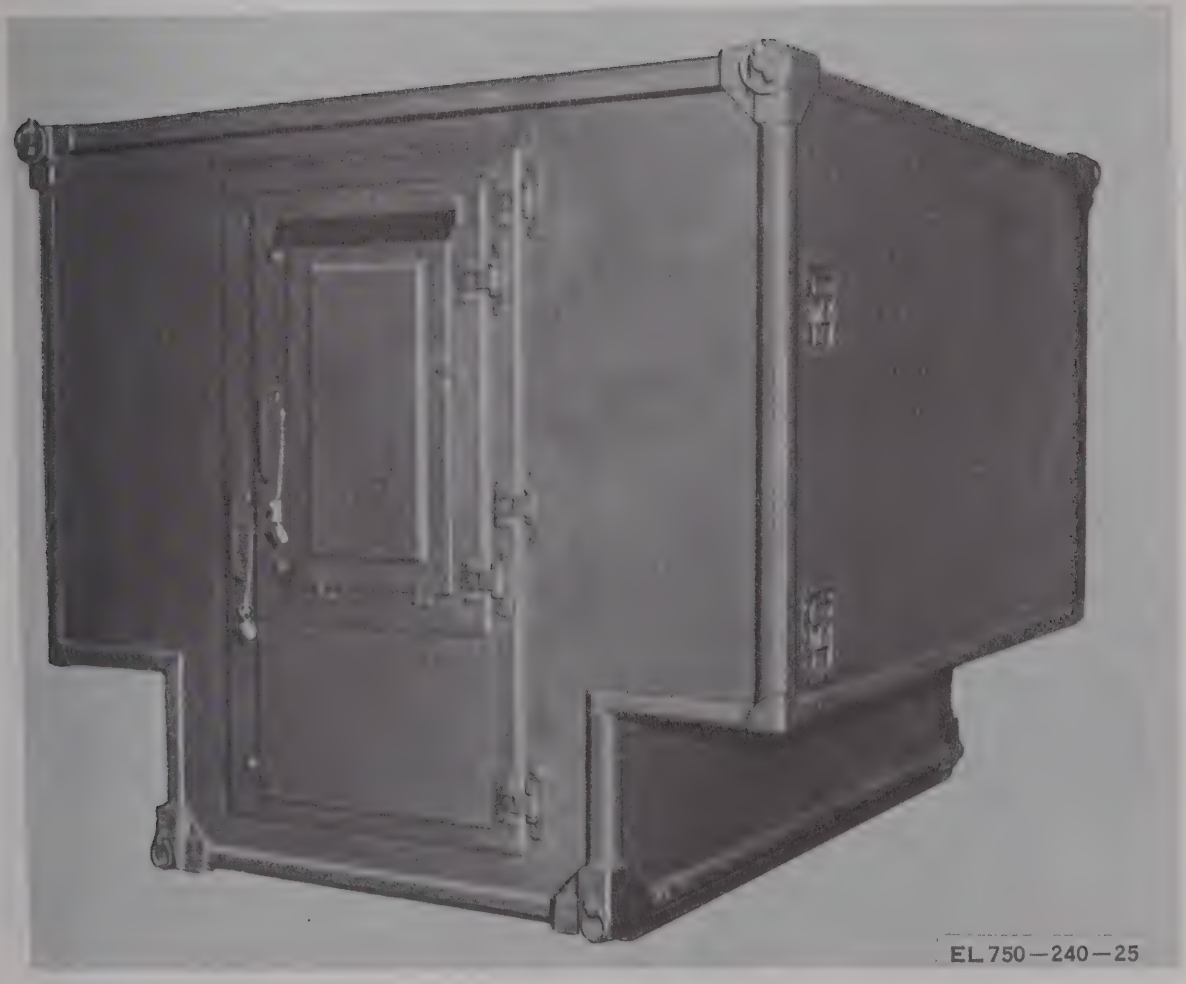

Figure 27. Shelter, Electrical Equipment S–250/G, front and side panel identifying features.

Figure 28. Shelter, Electrical Equipment S–280/G, front and side panel identifying features.

Figure 29. Shelter, Electrical Equipment S–318/G, front and side panel identifying features.

APPENDIX C

REPAIR KIT, ELECTRONIC EQUIPMENT SHELTER MK-680/G

The item listing for the MK-680/G (FSN 5410-793-2021, Electronics Command Procurement Parts List 3071) is provided in paragraph 1, and the procedures for use of the MW-680/G are provided in paragraph 2 below.

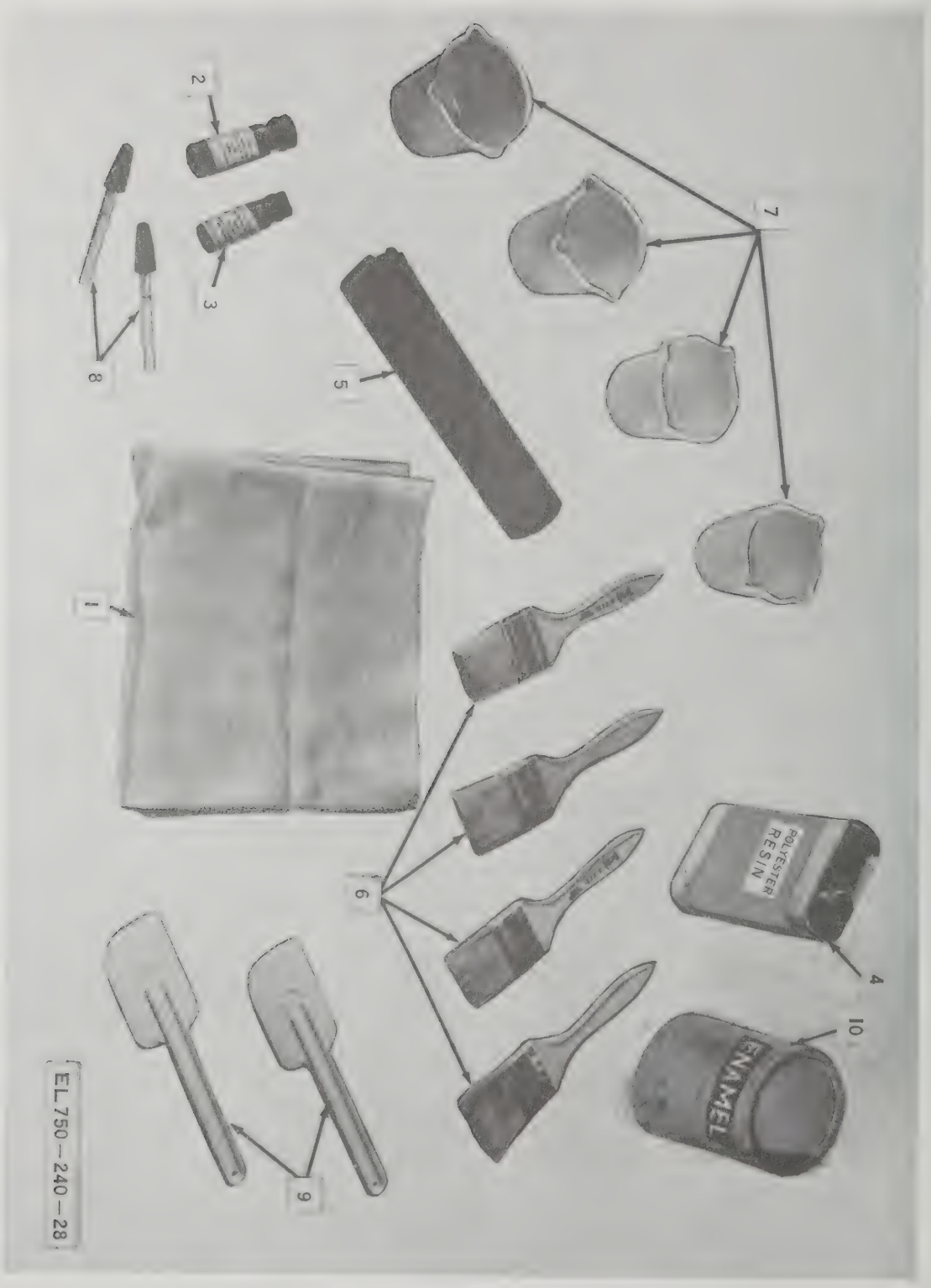

Figure 30. Repair Kit, Electronic Equipment Shelter MK-680/G, less cardboard container, instruction sheet, and packing list.

1. Item Listing
(fig. 30)

Illustration item No.	Quantity (ea)	Description	Federal stock number
1	1	Glass cloth, 10 oz, 36 by 38 inches, J.P. Stevens Part No. 7500	8305-530-0109
2	1	Methyl ethyl keytone peroxide, 12 cc; per MIL-M-81351	
3	1	Cobalt napthenate, 6% solution, Mooney Chemicals Inc., 7 cc	
4	2	Polyester resin, 1 pt can; MIL-R-7575, Grade A, Class 0	
5		Abrasive cloth, aluminum oxide, 9 by 11 sheet, P-C-451	
	3	Grade # 60, 50 per sleeve	5350-253-4393
	1	Grade # 40, 50 per sleeve	5350-246-0331
6	6	Brush, paint, 2 inches; Baker Brush Co., Part No. 1022W	8020-260-1304
7	4	Cup, polyethylene, 8 oz size, Burrougghs Mfg. Co., Part No. 332P	6640-952-3806
8	2	Dropper, polyethylene, with synthetic rubber bulb, 1 cc	6640-952-3807
9	2	Spatula, polyethylene, 6 inches long, blade . by 2 inches	6640-074-4344
10	1	Enamel, dark green lusterless, 1 qt. can, MIL-E-460461 (MO)	8010-905-7133

2. Use of Mk-680/G

To patch skin punctures on a lightweight shelter, follow the procedures below:

a. Remove all paint or foreign matter from an area approximately 3 inches wide around the puncture with abrasive cloth, a knife, or a scraper. Be sure that the area is completely clean. Do not touch the area with the hands or wipe with an oily cloth.

b. Cut a piece of glass cloth that will cover the puncture and an area approximately 2 inches wide around the puncture.

c. Determine the amount of polyester resin required by allowing 3 ounces for each square foot of surface to be covered.

d. Pour the required amount of polyester resin into a polyethylene cup.

WARNING

Avoid bodily contact with the polyester resin or methyl ethyl ketone peroxide. Bodily contact with the polyester resin or methyl ethyl keytone peroxide will result in dermatitis (inflammation of the skin). If any part of the body comes in contact with the polyester resin or methyl ethyl keytone peroxide, wash the area immediately.

e. The bonding mixture must be proportionately mixed to set properly in various temperatures. Determine the Fahrenheit temperature, and follow the procedures in (1), (2), or (3) below to prepare the bonding mixture.

NOTE

The procedures in (1), (2), and (3) below indicate the proper quantities of methyl ethyl keytone peroxide and cobalt napthenate to be mixed with 3 ounces of polyester resin. If more than 3 ounces of polyester resin is required, increase the quantities of methyl ethyl keytone peroxide and cobalt napthenate proportionally.

(1) *Temperature above 55° F.*

(a) Fill a polyethylene dropper to its redline with methyl ethyl keytone peroxide.

(b) Pour the contents of the polyethylene dropper into the polyethylene cup and mix thoroughly.

(2) *Temperatures between 20° F. and 55° F.*

(a) Fill one polyethylene dropper to the redline with methyl ethyl keytone peroxide.

(b) Half fill the remaining polyethylene dropper with cobalt napthenate.

(c) Pour the contents of each polyethylene dropper into the polyethylene cup and mix thoroughly.

(3) *Temperatures below 20° F.*

(a) Fill one polyethylene dropper to the redline with methyl ethyl keytone peroxide.

(b) Fill the remaining polyethylene dropper to the redline with cobalt napthenate.

(c) Pour the methyl ethyl keytone peroxide into the polyethylene cup and mix thoroughly.

(d) Pour the cobalt napthenate into the polyethylene cup and mix thoroughly.

NOTE

To insure proper setting of the bonding mixture at low temperatures, the area to be patched should be heated with radiant heat or warm dry air. *Do not* allow the

skin surface temperature of the shelter to exceed 54.6° C. Use Thermometer, Selt-Indicating, Bi-Metallic MX–1570/G (FSN 6685–663–4811) for monitoring the surface temperature. *Do not* use a warm liquid to warm the area because the liquid will damage the bond between the shelter skin and the foam-core.

WARNING

Foam-core materials used in lightweight shelters are highly flammable under heat and release harmful black smoke when ignited. *Do not* use an open flame to heat the area requiring patching.

f. Apply a liberal coating of the bonding mixture to the area that requires patching with a polyethylene spatula, and force the bonding mixture between delaminated skin and foam-core areas. A paint brush may be used for hard-to-reach areas or during high temperatures.

g. Place the glass cloth over the coating, and press lightly with the paint brush or polyethylene spatula.

h. Apply a liberal coating of the bonding mixture over the glass cloth; work from the center of the glass cloth to the extreme edges. Be sure that all edges of the glass cloth are thoroughly covered.

i. Examine the patch thoroughly to insure that no small pinholes exist and that all edges are flat.

j. Apply additional coatings of the bonding mixture if required.

k. Allow the bonding mixture to set thoroughly. The bonding mixture requires from 4 to 6 hours to set, depending on temperatures.

l. Sand and paint the surface to improve the appearance.

m. When the bonding mixture has set in the polyethylene cup and on the polyethylene spatula, flex the cup and spatula to remove the bonding mixture.

n. Discard used paint brushes, and retain the remaining items of the MK–680/G.

o. Recap all containers securely and store the MK–680/G in a cool, dry place.

NOTE

Shelf life of the MK–680/G is severely limited by heat. Do not store the MK–680/G in a warm place.

APPENDIX D

REPAIR KIT, ELECTRONIC EQUIPMENT SHELTER MK–681/G

The item listing for the MK–681/G (FSN 5410–771–3354, Electronics Command Procurement Parts List No. 1952) is provided in paragraph 1 and the procedures for the use of the MK–681/G are provided in paragraph 2 below:

1. Item Listing

(fig. 31)

Illustration item No.	*Quantity (ea)*	*Description*	*Federal stock number*
1	1	Cloth, cotton, cheesecloth, 36 in. wide, 8 yd long	8305–267–3015
2	1	Block insulation, 6 by 10 by 10 inches	5640–070–4509
3	1	Polyester resin, 1-pint can, OD color, Delorne Industries Part No. 797	8030–070–5747
4	1	Enamel, lusterless, 1-quart can	8010–069–1266
5	1	Paint thinner, 1-pint can	6810–579–8431
6	2	Polyethylene spatula, approx 6 inches long, blade approximately 1½ inches wide and 2 inches long.	6640–074–4344
7	2	Paint brush, 1-inch	8020–260–1306
8	2	Cup, polyethylene, 8-oz size, graduated	6640–952–3806
9	1 roll	Masking tape, 1 inch wide	7510–266–6712
10	1	Methyl ethyl keytone peroxide, 12 cc, Delorne Industries Part No. 237	6810–266–1276
11	1	Coldweather promotor, 7 cc, Delorne Industries Part No. 347	6850–078–5642
12	2 gross	Screw, self-tapping, Phillip's recessed head, No. 6, ½ inch	5305–281–5544
13	1	Phillip's screwdriver, 4 inches long, No. 2	5120–234–8913
14	1	Awl, 5 inches long	5120–221–1542
15	1	Key, socket head, 1/16 inch across flats	5120–240–5274
16	100	Depressor, tongue, wood	6515–324–5500
17	1	Knife, square point, 3⅞ inches long blade	5110–242–6164
18	3	Prepunched aluminum patch 2¾ by 4¾ inches	9535–069–9457
18	3	Prepunched aluminum patch 2¾ by 8¾ inches	9535–069–9458
18	3	Prepunched aluminum patch 2¾ by 12¾ inches	9535–069–9459
18	3	Prepunched aluminum patch 4¾ by 8¾ inches	9535–069–9460
18	3	Prepunched aluminum patch 4¾ by 12¾ inches	9535–069–9461
18	3	Prepunched aluminum patch 6¾ by 8¾ inches	9535–069–9462
18	3	Prepunched aluminum patch 6¾ by 12¾ inches	9535–069–9463
19	9 sheets	Coarse grit emery cloth, 9 by 11 inches	5350–221–0888
20	1	Enamel, lusterless Green, Solar and Heat Reflecting, 1 qt can (not shown).	8010–905–7133
21	1	Enamel, lusterless white, quick-drying styrenated alkyd type, 1 pt pressurized can (not shown).	8010–878–5761

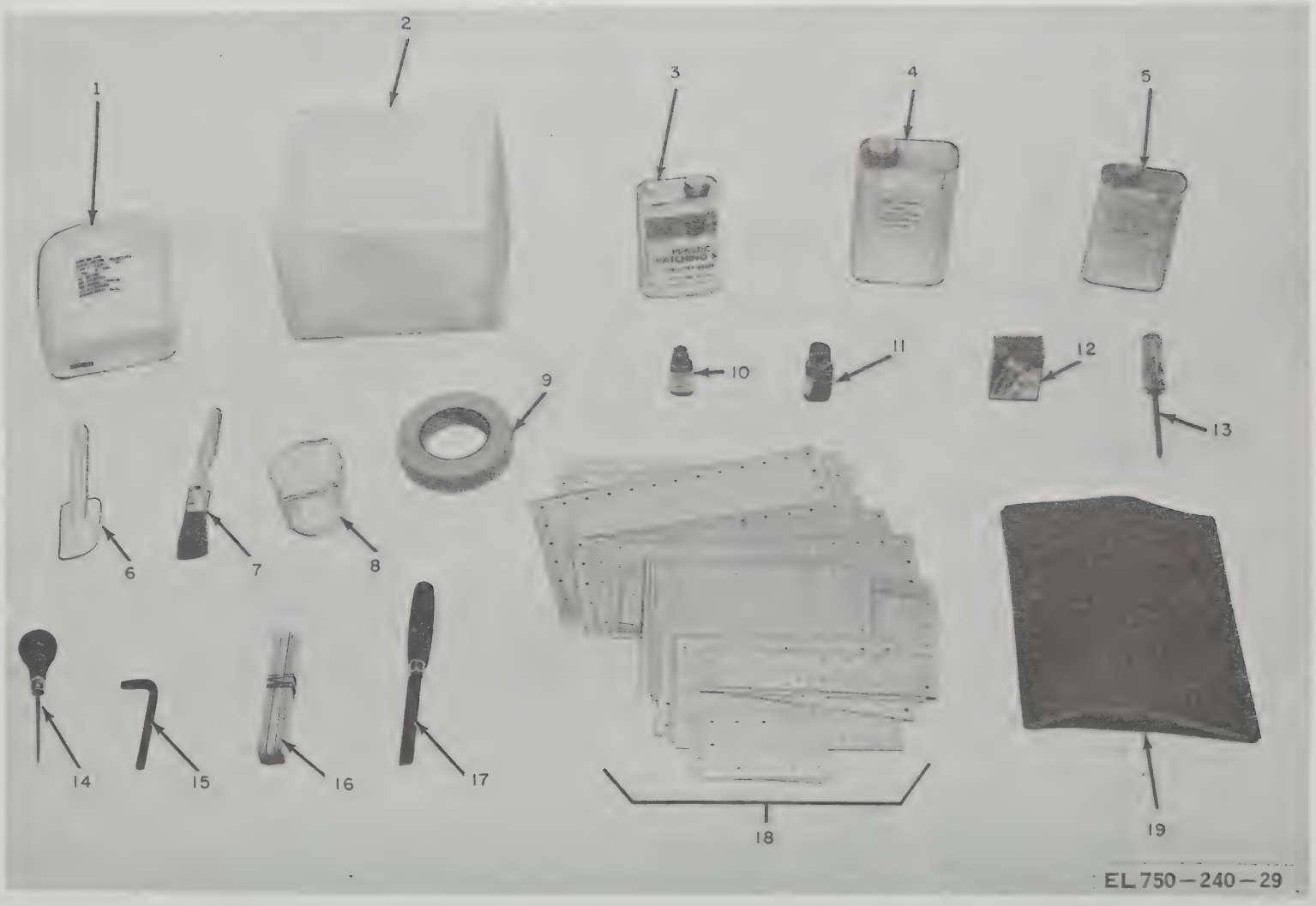

Figure 31. Repair Kit, Electronic Equipment Shelter MK-681/G, less cardboard container and packing list.

2. Use of MK–681/G

a. Select a prepunched aluminum patch that overlaps the puncture by at least 1 inch.

b. Position the prepunched aluminum patch over the puncture and lightly scribe the area of the patch on the shelter skin.

c. Use the prepunched aluminum patch as a template and use the awl to punch holes (not exceeding one-sixteenth inch in diameter) in the shelter skin.

d. Use emery cloth and remove all paint or foreign matter from the area to be covered. Be sure that the area is completely clean. Do not touch the area with the hands or wipe with an oily cloth.

e. Cut a piece of block insulation to fill the puncture, flush with the contour of the shelter skin.

f. Mix the bonding mixture as indicated in paragraph 2*e*, appendix C.

g. Use a paint brush to apply the bonding mixture to the inside of the puncture and insert the piece of block insulation (*e* above) into the puncture.

h. Coat the back surface of the prepunched aluminum patch with the bonding mixture.

i. Position the prepunched aluminum patch over the filled-in puncture and secure it to the shelter skin with the sheet metal screws (dipped in the bonding mixture). Sequentially tighten the sheet metal screws until snug, working from the center on each side of the prepunched aluminum patch to the corners, and then turn each screw (in the same manner) an additional one-quarter turn.

j. Smooth and taper adhesive (squeezed out during the fastening process) along the edges of the prepunched aluminum patch and around the heads of each sheet metal screw. Clean off excess bonding mixture.

k. Paint the repaired area, being sure that all sheet metal screwheads are thoroughly covered.

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APPENDIX E

MAINTENANCE KIT ELECTRONIC EQUIPMENT SHELTER MK-679/G

The item listing for the MK-679/G (FSN 5410-973-2936, Elcctronics Command Procurement Parts List No. 1951) is provided in paragraph 1. The procedures for preparing materials are provided in paragraph 2, and the procedures for preparing the polysulfide sealant are provided in paragraph 3 below.

1. Item Listing

Quantity (ea)	*Description*	*Federal stock number*
1	Maintenance kit, insulation (*a* below)	5840-678-0538
1	Hardware kit consisting of various types and sizes of rivnuts, pop rivets, and huck rivets (*b* below).	5410-952-3383
1	Repair kit, electronic equipment shelter consisting of 3 each of 7 sizes of prepunched aluminum patches (*c* below).	
3 rolls	Cloth, cotton, cheesecloth, bleached 36 inches wide, 10 yards	8305-267-3015
1	Gun calking, with accessories and sealant cartridges	5120-952-3382
1 pkg	Gloves, polyethylene, 15 pair	8415-682-6786
1	Scale, beam indicating	6670-952-3317
3	Scraper, paint	5110-952-3380
6 rolls	Tape, pressure sensitive, 1 inch wide	7510-266-6712
6 rolls	Tape, pressure sensitive, 1½ inches wide	7510-266-6714
1	Weight kit	6670-952-3318
1	Monometer, slack tube, range 4-0-4	6685-952-3320
6	Adhesive, silicone rubber, 6-ounce tube, black (Dow Corning Silastic)	8040-952-3520
6	Brush, varnish, flat, chisel edge, 2 inches wide	8020-260-1304
24	Catalyst NAFIL A-2, 1.17-ounce vial, for resin NAFIL AR-20	8040-952-3521
4	Enamel, semigloss, light green, 1-quart can, color 24533 per Fed Std 595	8010-598-5648
1	Enamel, Alykid, lusterless gray, 1-gallon can, TT-E-527 color 36118, Federal Standard 595.	8010-297-0549
1	Enamel, lusterless, OD, 1-gallon can, color 24087, Fed Std 595	NSN 8010-00-297-5060
2	Primer for silastic TRV891, 1-pint can, black	8030-845-4304
1	Primer, zinc chromate, color T, tinted to match interior green color #34151, Federal Specification TT-C-595, 1-gallon can	8010-582-5318
24	Resin NAFIL AR-20, 1-pound package in 1-quart friction top metal container	8030-952-3558
48	Sealing compound, polysulfide base, black, packaged in 1½ pint double compartment can, 3M resin EC-801 w/catalyst EC-1063.	8030-275-8110
2	Strip, sealing, silicone rubber 1-inch wide by ⅛-inch thick by 50 feet long, adhesive both side paper back 3M #EC 1202.	5330-892-2279
2	Thinner, synthetic resin enamel, 1-gallon can, TT-T-306	8010-160-5794
4	Graduate, liquid, laboratory, polyethylene, 8-ounce capacity	6640-952-3806
4	Graduate, liquid, laboratory, polyethylene, 32-ounce capacity	6640-952-3805
4	Pipette, volumetric (polyethylene eye dropper)	6640-952-3807
1	1, 1, 1 Trichloroethane, 1-gallon can O-T-00620	6810-664-0387
1	Methyl ethyl keytone, 1-gallon can TT-M-2616	6810-281-2785
1 roll	Cloth, abrasive, grit No. 40, 50 sheet sleeve	5350-192-9318
1	Cloth, abrasive, grit No. 60, 50-sheet sleeve	5350-192-5046
1	Cloth, abrasive, grit No. 80, 50-sheet sleeve	5350-192-5047
1	Enamel, lusterless, white, quick-drying, styrenated alkyd type, 1-gallon container	8010-297-2111
1	Enamel, lusterless, green, solar and heat reflecting, 1-gallon container	8010-985-7258

a. Maintenance Kit, Insulation (fig. 32).

Item No.	*Quantity (ea)*	*Description*
1	1	Mixer 735, ¼-pint can.
2	1	Micro-balons BJO 0930, ½-pint can.
3	2	Resin, epoxy ERL–2774, 1-pint can.
4	1	Block insulation, 6 by 10 by inches.
5	1	Packing list.
6	1	Stone, sharpening.
7	1	Knife.
8	1	Mixing board.
9	1	Cloth, fiberglass, 18 by 18 inches.
10	6	Brush, varnish, rubber-set, 2 inches wide.
11	1 pair	Gloves, size 10½.

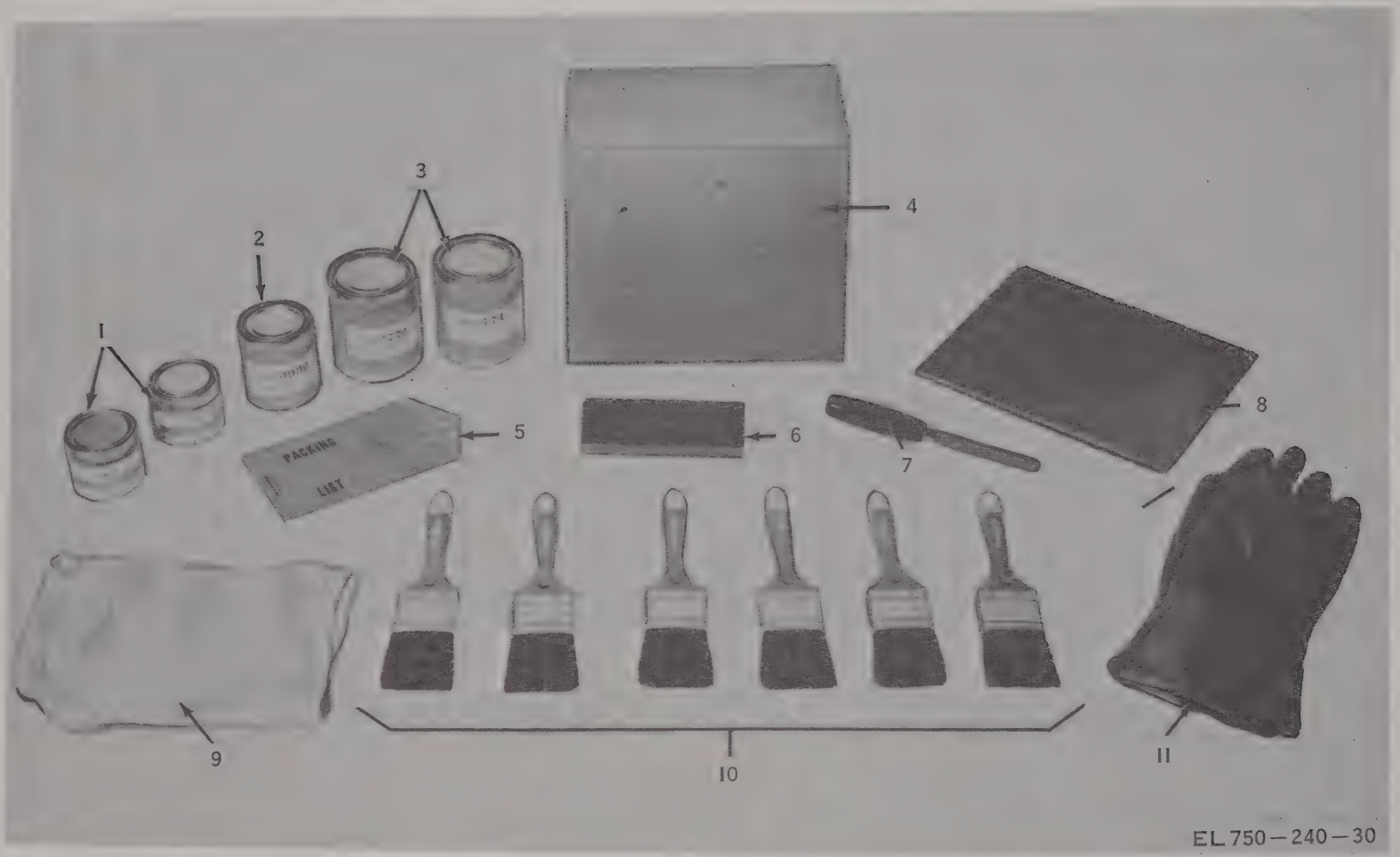

Figure 32. Maintenance kit, insulation, less cardboard container, part of Maintenance Kit, Electronic Equipment Shelter MK–679/G.

b. Hardware Kit (FSN 5410–952–3383, Electronics Command Procurement Parts List No. 1954) (fig. 33).

Illustration item No.	Quantity (ea)	Description	Federal stock No.
1	50	Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.251 to 0.312	5320–721–5385
1	50	Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.313 to 0.375	5320–721–5388
1	50	Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.563 to 0.625.	5320–061–9655
1	50	Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.626 to 0.687.	5320–061–9656
2	1,000	Rivet, blind: "pop," dome head, solid core, United Shoe Mfg Co, No. AD41S, or equal, grip range 0.025 to 0.062, ⅛ inch dia.	5320–957–3581
2	1,000	Rivet, blind: "pop," dome head, solid core, United Shoe Mfg. Co., No. AD42S, or equal, grip range 0.063 to 0.125, ⅛ inch dia.	5320–957–3582
2	1,000	Rivet, blind: "pop," dome head, solid core, United Shoe Mfg Co, No. AD43S, or equal, grip range 0.126 to 0.187, ⅛ inch dia.	5320–952–4162
2	1,000	Rivet, blind: "pop" dome head, solid core, United Shoe Mfg Co, No. AD62S, or equal, grip range 0.025 to 0.125, 3/16 inch dia.	5320–952–4160
2	1,000	Rivet, blind: "pop," dome head, solid core, United Shoe Mfg. Co, No. AD64S, or equal, grip range 0.126 to 0.250, 3/16 inch dia.	5320–952–4159
2	1,000	Rivet, blind: "pop," dome head, solid core, United Shoe Mfg. Co, No. AD66S, or equal, grip range 0.251 to 0.375, 3/16 inch dia.	5320–952–4161
3	50	Nut, blind rivet: "rivnut," size ¼–20, B.F. Goodrich Part No. A25–B–140, or equal, grip range 0.080 to 0.140, closed end.	5310–952–3631
3	50	Nut, blind rivet: "rivnut," size ¼–20, B.F. Goodrich Part No. A25–B–200, or equal, grip range 0.140 to 0.200, closed end.	5310–952–3632
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–B–125, or equal, grip range 0.050 to 0.125, closed end.	5310–952–3603
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–B–200, or equal, grip range 0.125 to 0.200, closed end.	5310–952–3604
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A–31–B–275, or equal, grip range 0.200 to 0.275, closed end.	5310–952–3605
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–B–350, or equal, grip range 0.275 to 0.350, closed end.	5310–952–3607
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–B–425, or equal, grip range 0.350 to 0.425, closed end.	5310–952–3626
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–B–500, or equal, grip range 0.425 to 0.500, closed end.	5310–952–3627
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. SS31–B–125, or equal, grip range 0.050 to 0.125, closed end.	5310–952–3634
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. SS31–B–200, or equal, grip range 0.125 to 0.200, closed end.	5310–952–3628
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. SS31–B–275, or equal, grip range 0–200 to 0.275, closed end.	5310–952–3635
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. SS31–B–350, or equal, grip range 0.275 to 0.350, closed end.	5310–952–3679
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. SS31–B–425, or equal, grip range 0.350 to 0.425, closed end.	5310–952–3680
3	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. SS31–B–500, or equal, grip range 0.425 to 0.500, closed end.	5310–952–3681
4	100	Nut, blind rivet: "rivnut," size 6–32, B.F. Goodrich Part No. A6–75, or equal, grip range 0.010 to 0.075, open end.	5310–082–1030
4	100	Nut, blind rivet: "rivnut," size 6–32, B.F. Goodrich Part No. A6–120, or equal, grip range 0.075 to 0.120, open end.	5310–952–3444
4	100	Nut, blind rivet: "rivnut," size 6–32, B.F. Goodrich Part No. A6–160, or equal, grip range 0.120 to 0.160, open end.	5310–952–3445
4	100	Nut, blind rivet: "rivnut," size 6–32, B.F. Goodrich Part No. A6–200, or equal, grip range 0.160 to 0.200, open end.	5310–952–3446
4	100	Nut, blind rivet: "rivnut," size 6–32, B.F. Goodrich Part No. A6–240, or equal, grip range 0.200 to 0.240, open end.	5310–952–3465
4	100	Nut, blind rivet: "rivnut," size 6–32, B.F. Goodrich Part No. A6–280, or equal, range 0.240 to 0.280, open end.	5310–952–3466
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–75, or equal, grip range 0.010 to 0.075, open end.	5310–952–3467

Illustration item No.	Quantity (ea)	Description	Federal stock No.
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–120, or equal, grip range 0.075 to 0.120, open end.	5310–952–3468
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–160, or equal, grip range 0.120 to 0.160, open end.	5310–952–3469
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–200, or equal, grip range 0.160 to 0.200, open end.	5310–952–3470
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–240, or equal, grip range 0.200 to 0.240, open end.	5310–952–3471
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–280, or equal, grip range 0.240 to 0.280, open end.	5310–952–3472
4	100	Nut, blind rivet: "rivnut," size 8–32, B.F. Goodrich Part No. A8–160, or equal, grip range 0.120 to 0.080, open end.	5310–045–9116
4	100	Nut, blind rivet: "rivnut," size 10–32, B.F. Goodrich Part No. A10–80, or equal, grip range 0.010 to 0.080, open end.	5310–952–3560
4	100	Nut, blind rivet: "rivnut," size 10–32, B.F. Goodrich Part No. A10–130, or equal, grip range 0.080 to 0.130, open end.	5310–952–3561
4	100	Nut, blind rivet: "rivnut," size 10–32, B.F. Goodrich Part No. A10–180, or equal, grip range 0.130 to 0.180, open end.	5310–952–3562
4	100	Nut, blind rivet: "rivnut," size 10–32, B.F. Goodrich Part No. A10–230, or equal, grip range 0.180 to 0.230, open end.	5310–952–3563
4	100	Nut, blind rivet: "rivnut," size 10–32, B.F. Goodrich Part No. A10–280, or equal, grip range 0.230 to 0.280, open end.	5310–952–3564
4	100	Nut, blind rivet: "rivnut," size 10–32, B.F. Goodrich Part No. A10–330, or equal, grip range 0.280 to 0.330, open end.	5310–952–3565
4	50	Nut, blind rivet: "rivnut," size 1/4–20, B.F. Goodrich Part No. A25–80, or equal, grip range 0.020 to 0.080, open end.	5310–952–3629
4	50	Nut, blind rivet: "rivnut," size 1/4–20, B.F. Goodrich Part No. A25–140, or equal, grip range 0.080 to 0.140, open end.	5310–952–3630
4	50	Nut, blind rivet: "rivnut," size 1/4–20, B.F. Goodrich Part No. A25–200, or equal, grip range 0.140 to 0.200, open end.	5310–952–3606
4	50	Nut, blind rivet: "rivnut," size 1/4–20, B.F. Goodrich Part No. A25–260, or equal, grip range 0.200 to 0.260, open end.	5310–952–3633
4	50	Nut, blind rivet: "rivnut," size 1/4–20, B.F. Goodrich Part No. A25–320, or equal, grip range 0.260 to 0.320, open end.	5310–952–3473
4	50	Nut, blind rivet: "rivnut," size 1/4–20, B.F. Goodrich Part No. A25–380, or equal, grip range 0.320 to 0.380.	5310–952–3566
4	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–125, or equal, grip range 0.050 to 0.125, open end.	5310–952–3567
4	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–200, or equal, grip range 0.125 to 0.200, open end.	5310–619–4502
4	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–275, or equal, grip range 0.200 to 0.275, open end.	5310–952–3599
4	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–350, or equal, grip range 0.270 to 0.350, open end.	5310–952–3600
4	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–425, or equal, grip range 0.350 to 0.425, open end.	5310–952–3601
4	50	Nut, blind rivet: "rivnut," size 5/16–18, B.F. Goodrich Part No. A31–500, or equal, grip range 0.425 to 0.500, open end.	5310–952–3602
	50	Rivet, blind: Blind bolt, 1/4 inch size, Huck Mfg. Co. Part No. OSR 8F, or equal, grip range 0.351 to 0.400.	5320–975–4579
	50	Rivet, blind: Blind bolt, 1/4 inch size, Huck Mfg. Co. Part No. OSR 8G, or equal, grip range 0.401 to 0.450.	5320–994–7024
	50	Rivet, blind: Blind bolt, 1/4 inch size, Huck Mfg. Co. Part No. OSR 8H, or equal, grip range 0.451 to 0.500.	5320–986–6889

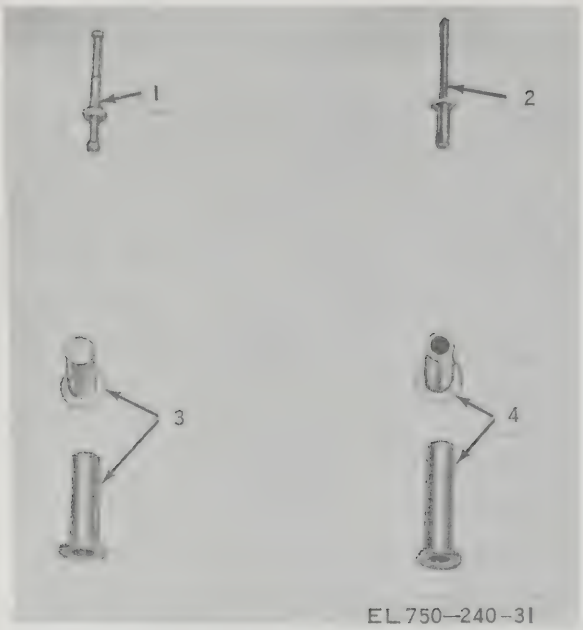

Figure 33. Rivnuts and pop rivets of hardware kit, part of Maintenance Kit, Electronic Equipment Shelter MK–679/G.

c. Repair Kit.

Quantity (ea)	Description	Federal stock No.
6	Patch, aluminum, 5⅝ by 3⅝	5410–952–3526
6	Patch, aluminum, 9⅜ by 3⅝	5410–952–3527
6	Patch, aluminum, 13⅜ by 3⅝	5410–952–3528
6	Patch, aluminum, 9⅜ by 5⅝	5410–952–3529
6	Patch, aluminum, 13⅜ by 5⅝	5410–952–3384
6	Patch, aluminum, 9⅜ by 7⅝	5410–952–3386
6	Patch, aluminum, 13⅜ by 7⅝	5410–952–3385

2. Preparing Materials

NOTE

All proportions for foaming, laminating, and repair mixes are based on weight. Weigh the materials with the beam indicating scale contained in the MK–679/G.

a. Foaming Mix. The foaming mix is used to restablish the foam-core within a sandwich construction. Determine the amount of foaming mix required by allowing 1.17 ounces of catalyst NAFIL AR–20 into the 24-ounce graduate. 20 for 500 cubic inches of foam-core material.

(1) Pour the required amount of catalyst NAFIL HZ–2 into the 4-ounce graduate.

(2) Pour the required amount of resin NAFIL AR–20 into the 24-ounce graduate.

CAUTION

Before mixing the catalyst NAFIL HZ–2 and resin NAFIL AR–20 ((3) below, be sure that the cavity or opening where the foaming mix will be poured is properly prepared. As soon as the materials are mixed and turn a milky color, pour the mix into the cavity with even distribution.

(3) Pour the contents of the 4-ounce graduate into the 24-ounce graduate, and beat until the mixture turns milky color.

b. Laminating or Bonding Mix. The laminating or bonding mix is used for rebonding delaminated skin to foam-core areas exceeding a 100-square-inch area. Prepare the laminating or bonding mix as follows:

(1) Follow the procedures in (*a*), (*b*), and (*c*) below to prepare the laminating or bonding mix required for repairing delaminated areas where the skin of the shelter is less than one-sixteenth inch from the foam-core.

(*a*) Determine the quantity required and weigh 4 parts of resin (ERL 2774) to 1 part of mixer 735.

(*b*) Thoroughly mix the resin and catalyst in the mixing container and fill the polyethylene cartridge of the calking gun with the resin.

(*c*) Follow the procedures in paragraph 19 to repair the delaminated area.

NOTE

The working life of this resin is approximately 30 minutes.

(2) Follow the procedures in (*a*), (*b*), and (*c*) below to prepare the laminating or bonding mix required for repairing delaminated areas where the skin of the shelter is more than one-sixteenth inch from the foam-core.

(*a*) Determine the quantity required and weigh 4 parts of resin (ERL 2774) to 1 part of mixer 735.

(*b*) Thoroughly mix the resin and catalyst in the mixing container and add micro-balloons (BJO 0930) until the desired viscosity is obtained. The resin should be thin enough to pour from the mixing container into the polyethylene cartridge of the calking gun.

(*c*) Follow the procedures in paragraph 19 to repair the delaminated area.

c. Repair Mix. The repair mix is used for filling in dents or punctures. Prepare the repair mix by following the procedures in *b* above using micro-balloons (BJO 0930) until the putty-like form is obtained.

3. Polysulfide Sealant

Determine the amount of polysulfide sealant required and weigh 15 parts of catalyst (EC–1063) to 100 parts of resin (EC–801); use the beam-indicating scale contained in the MK–679/G.

WARNING

Catalyst (EC–1063) contains lead. Avoid inhaling; catalyst fumes are dangerous. Make sure that adequate ventilation is provided. The catalyst is flammable; do not use near a flame. Wear protective gloves.

a. Thoroughly stir catalyst (EC–1063) until a smooth paste is obtained. Do not spill off floating liquid.

b. Mix catalyst (EC–1063) with resin (EC–801) in the 24-ounce graduate to obtain the polysulfide sealant.

NOTE

The polysulfide sealant requires a minimum of 6 hours to set.

APPENDIX F

TOOL KIT, ELECTRONIC EQUIPMENT SHELTER TK–144/G

(FSN 5180–973–4369)

NOTE

Items of the TK–144/G are illustrated in figure 34 which consists of three parts.

Illustration item No.	*Quantity (ea)*	*Description*	*Federal stock No.*
1	1	Saw, reciprocating, portable, electric	5310–720–0654
2	1	Drill, electric, portable, ⅜-inch cup, pistol, grip.	5130–889–9001
3	1	Saw, circular, portable, electric, 2-inch diameter blade.	5130–086–7243
4	6	Clamp "C," light service, 4-inch size	5120–239–8151
5	1	Wrench, torque, 5 to 150 pound-inches	5120–221–7944
6	1	Square, carpenters, 24-inch body, 16-inch tongue.	5210–221–2050
7	1	Handle, file.	5110–595–8325
8	1	Socket, wrench, ¼-inch opening, ¼-inch square drive.	5120–236–2264
9	1	Socket, wrench, 5/16-inch opening, ¼-inch square drive.	5120–232–5703
10	1	Socket, wrench, 7/16-inch opening, ¼-inch square drive.	5120–239–0016
11	1	Socket wrench, ½-inch opening, ¼-inch square drive.	5120–277–4250
12	1	Awl, scratch, 3½-inch long blade	5120–221–1542
13	4	Nut, hexagonal, size 6–32	5310–085–7705
13	4	Nut, hexagonal, size 8–32	5310–062–3912
13	4	Nut, hexagonal, size 10–32	5310–062–3913
13	4	Nut, hexagonal, size ¼–20	5310–889–2541
13	4	Nut, hexagonal, size 5/16–18	5310–208–5326
14	2	Screw, machine, hexagonal head, 6–32 by 1 inch long.	5305–062–6112
14	2	Screw, machine head, 8–32 by 1 inch long	5305–889–2974
14	2	Screw, machine hexagonal head, 10–32 by 1 inch long.	5305–062–6113
14	2	Screw, machine, hexagonal head, ¼–20 by 1½ inches long.	5305–889–2976
14	2	Screw, machine, hexagonal head, 5/16–18 by 1½ inches long.	5305–889–2975
15	1	Tape measure, 72 inches long	5210–287–3335
16	1	Square, combination, 12-inch blade	5110–221–2068
17	1	Clamp, "C," light service, 2-inch size	5120–293–0784
18	1	File, rotary, ½-inch diameter ¼-inch shank 2½ inches long, medium.	3455–973–6282
19	6	Drill, twist, size 30	5133–189–9275
20	6	Drill, twist, size 12	5133–189–9257
21	6	Drill, twist, size 11	5133–189–9256
22	6	Drill, twist, size 2	5133–189–9247
23	6	Drill, twist, size E	5133–239–8606
24	6	Drill, twist, size F	5133–262–2192
25	6	Drill, twist, Size Q	5133–262–2165
26	6	Drill, twist, Size R	5133–262–2166
27	6	Drill, twist, Size Z	5133–262–2174
28	1	Gage, depth and angle, with hook rule	5210–293–2096
29	1	Scriber, machinest, size 1	5120–293–3408
30	1	File, hand, flat, 10 inches long, style B	5110–234–6537
31	1	Riveter, blind hand, tong type for pop rivets, with nosepiece	5110–249–2850
32	1	Riverter, blind hand, tong type for pop rivets, with nosepiece.	5120–973–0377
33	1	Riveter, blind hand, for huck rivets, Huck Model 194.	5120–776–1852

Illustration item No	Quantity ea	Description	Federal stock No.
33	1	Nose assembly for riveter, Huck Model 194	5120-776-1855
34	1	Nippers end cutting, 7 inches long compound lever attachable blade.	5110-086-7240
35	1	Shears, metal cutting, left-hand, 10 inches long.	5110-273-0126
36	1	Shears, straight trimmers, 9 inches long	5110-161-6912
37	1	Shears, metal cutting, right-hand, 10 inches long.	5110-273-0127
38	1	Riveter, blind hand, plier-type, for pop rivets, with nosepiece.	5120-970-6425
39	1	Riveter, blind hand for 6-32 rivnut	5120-224-9298
39	1	Riveter, blind hand for 8-32 rivnut	5120-224-9297
39	1	Riveter, blind hand for 10-32 rivnut	5120-224-9296
39	1	Riveter, blind hand for 10-32 rivnut	5120-224-9296
40	1	Hammer, inserted face, 2-pound, 2-in. dia. face	5120-357-6076
41	1	Forceps, sheet holder, plier grip, 8 inches long.	5120-221-1597
42	1 gross	Holder, sheet metal, ⅛ inch diameter	5120-541-1808
43	1	Wrench, open end, ⅝- and ⅜-inch openings	5120-224-3102
44	1	Riveter, blind hand, screw-type, for 5/16-18 rivnuts, with Allen wrench.	5120-973-0376
44	1	Riveter, blind hand, screw-type, for ¼-20 rivnuts, with Allen wrench.	5120-970-6423
45	1	Handle, socket wrench, ratchet type, ⅜-inch-square drive	5120-240-5364
46	1	Riveter, blind hand for huck rivets, Huck Model 115.	5120-792-3571
46	1	Nose assembly for riveter, Huck Model 115	5120-770-6129
	1	Mixer, paint, ¼-inch diameter shank	5130-034-4854
	1	Divider, mechanics, wing-type, 10 inches long	5210-266-7036
	1	Gasket Cement, Mystic Adhesive No. A132	8040-086-4834

Figure 34. Tool Kit, Electronic Equipment Shelter TK-144/G (sheet 1 of 3).

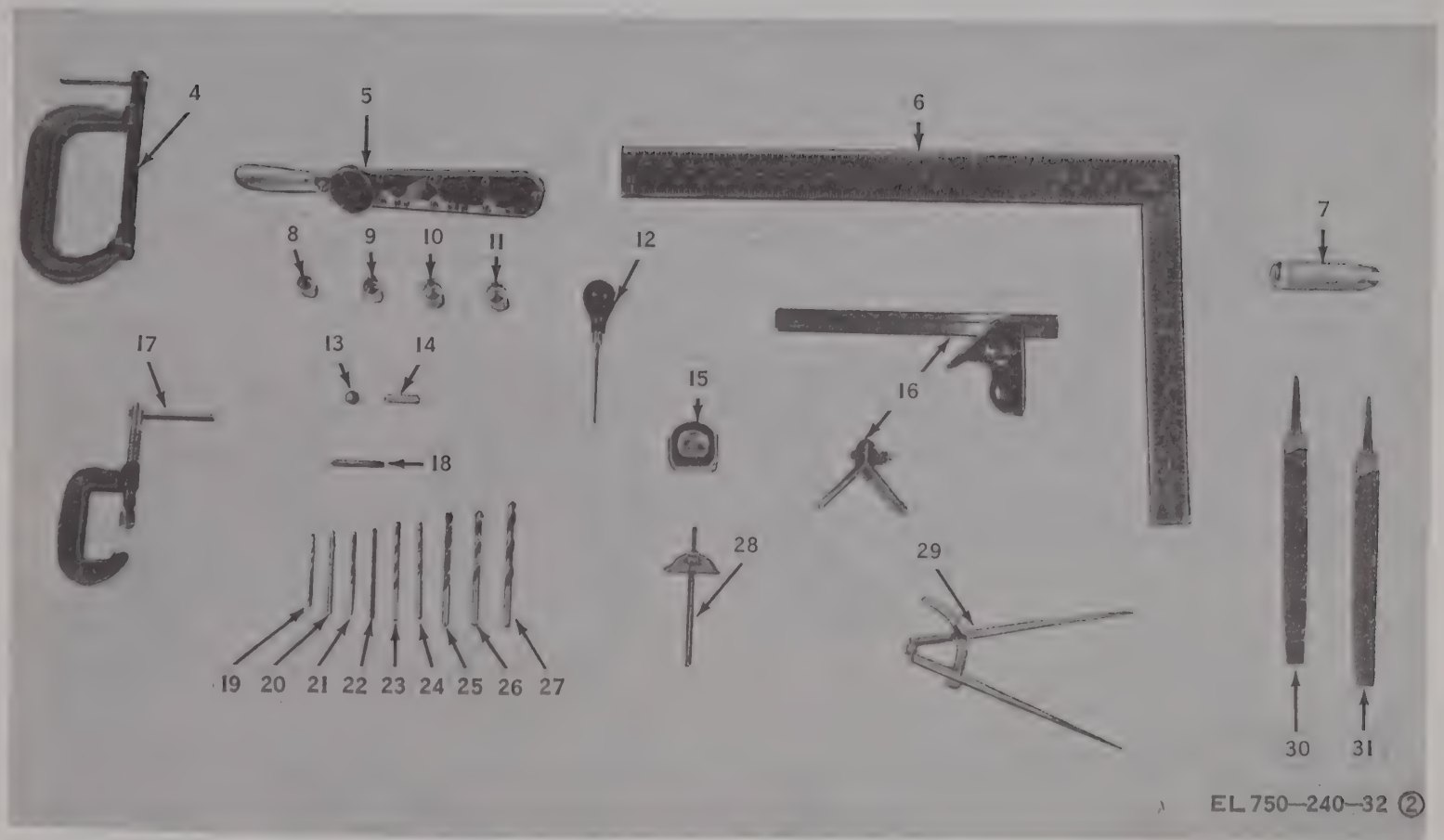

Figure 34. Tool Kit, Electronic Equipment Shelter TK–144/G (sheet 2 of 3).

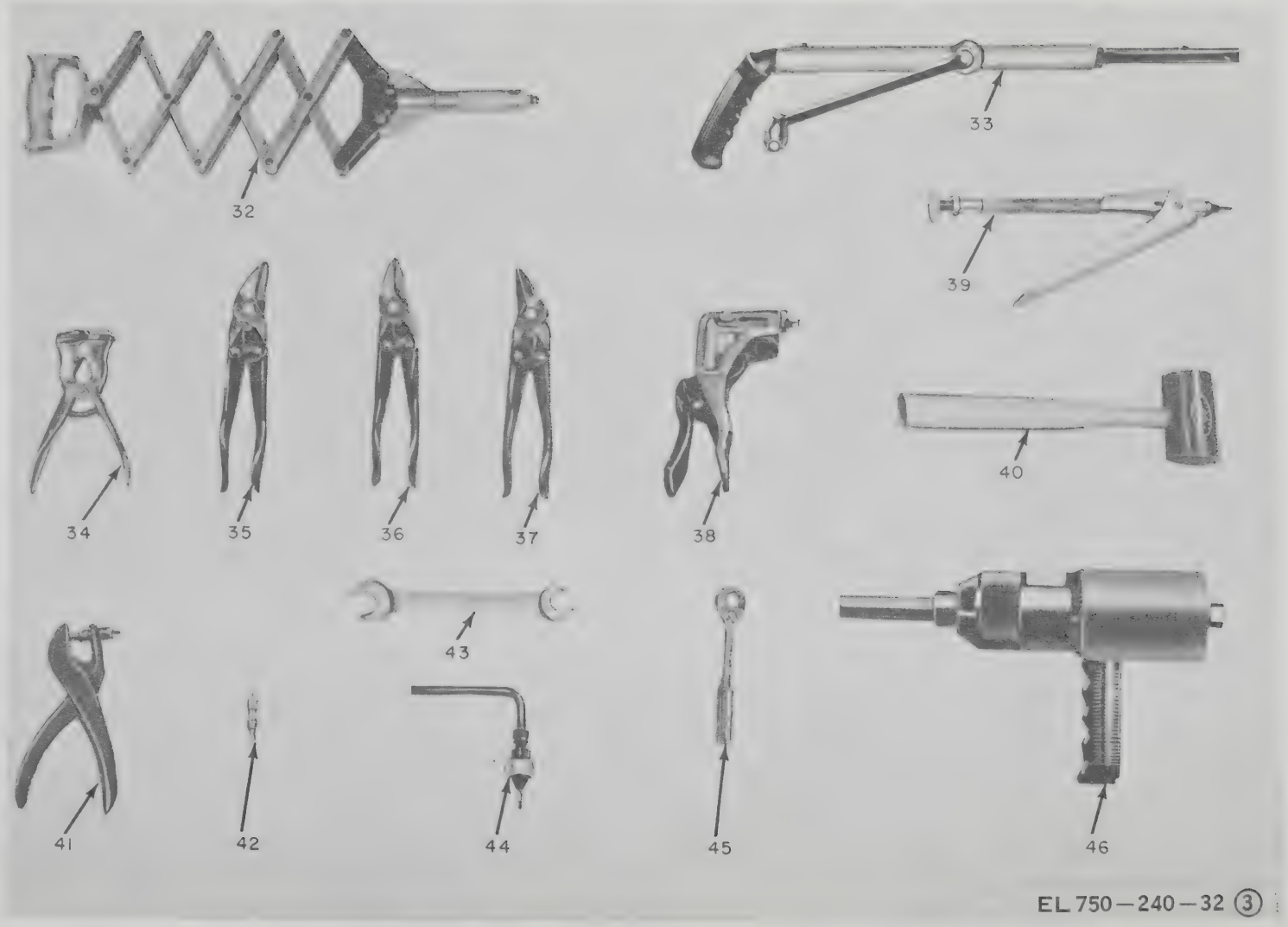

Figure 34. Tool Kit, Electronic Equipment Shelter TK-144/G (sheet 3 of 3).

By Order of the Secretary of the Army:

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General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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